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THE NATURE PRINTED BRITISH SEA WEEDS

JOHN LEIGHTON, F.S.A.

BY
W. G. JOHNSTONE
&
A. CROALL.

NATURE PRINTED
BY
HENRY BRADBURY.

LONDON.
BRADBURY & EVANS, 11, BOUVERIE ST.
1859.

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THE

NATURE-PRINTED

BRITISH SEA-WEEDS:

A HISTORY,

ACCOMPANIED BY FIGURES AND DISSECTIONS, OF THE ALGÆ OF THE BRITISH ISLES.

BY

WILLIAM GROSART JOHNSTONE, F.B.S.E.,

AND

ALEXANDER CROALL, A.B.S.E.

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NATURE-PRINTED BY HENRY BRADBURY.

IN FOUR VOLUMES.

VOL. III.—MELANOSPERMEÆ.

LONDON:
BRADBURY AND EVANS, 11, BOUVERIE STREET.
1860.

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BRADBURY AND EVANS,
PRINTERS EXTRAORDINARY TO THE QUEEN,
WHITEFRIARS

TO

WILLIAM HENRY HARVEY, ESQ., M.D., M.R.I.A.,

ETC., ETC.,

KEEPER OF THE HERBARIUM OF THE UNIVERSITY OF DUBLIN,

AND PROFESSOR OF BOTANY TO THE ROYAL DUBLIN SOCIETY,

This Third Volume of

THE NATURE-PRINTED BRITISH SEA-WEEDS

IS INSCRIBED,

AS A VERY INADEQUATE BUT A VERY SINCERE TRIBUTE

OF AFFECTION, ADMIRATION, AND GRATITUDE,

BY HIS FRIENDS

THE AUTHORS.

CONSPECTUS OF VOLUME III

Series III.—MELANOSPERMEÆ.

Frond leathery or membranaceous, forming a compact cellular substance.

Fam. I. **FUCACEÆ.**—Olive-coloured, inarticulate sea-weeds, whose spores are contained in spherical cavities of the frond. Containing:

Genus 1.—Halidrys.
2.—Cystoseira.
3.—Pycnophycus.
4.—Fucus.
5.—Himanthalia.

Fam. II. **SPOROCHNOIDEÆ.**—Olive-coloured, inarticulate sea-weeds, whose spores are attached to external, jointed filaments, which are either free or compacted together into knob-like masses. Containing:

Genus 1.—Desmarestia.
2.—Arthrocladia.
3.—Sporochnus.
4.—Carpomitra.

Fam. III. **LAMINARIEÆ.**—Olive-coloured, inarticulate sea-weeds, either forming superficial, cloud-like patches, or covering the whole surface of the frond. Containing:

Genus 1.—Alaria.
2.—Laminaria.
3.—Chorda.

FAM. IV. **DICTYOTEÆ.**—Olive-coloured, inarticulate sea-weeds, whose spores are superficially disposed in definite spots or sori. Containing:

Genus 1.—Cutleria.
2.—Haliseris.
3.—Padina.
4.—Zonaria.
5.—Taonia.
6.—Dictyota.
7.—Stilophora.
8.—Dictyosiphon.
9.—Striaria.
10.—Punctaria.
11.—Asperococcus.
12.—Litosiphon.

FAM. V. **CHORDARIEÆ.**—Olive-coloured sea-weeds, with a gelatinous or cartilaginous frond, composed of vertical and horizontal filaments interlaced together. Containing:

Genus 1.—Chordaria.
2.—Mesogloia.
3.—Leathesia.
4.—Ralfsia.
5.—Elachista.
6.—Myrionema.

FAM. VI. **ECTOCARPEÆ.**—Olive-coloured, articulated, filiform sea-weeds, whose spores are usually external and attached to the jointed ramuli. Containing:

Genus 1.—Cladostephus.
2.—Sphacelaria.
3.—Ectocarpus.
4.—Myriotrichia.

ALPHABETICAL INDEX OF SPECIES.

VOLUME III.

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Plate CXXX.

HALIDRYS SILIQUOSA.—*Lyngb.*

Gen. Char.—Frond coriaceous, linear, two-edged, distichously branched; air-vessels stalked, linear oblong, divided by numerous transverse dissepiments, and traversed by longitudinal filaments. Fructification: oblong stalked receptacles, containing immersed spherical conceptacles, communicating with the surface by a minute pore, and containing attached to their walls oblong spores, mixed with antheridia. Name from ἅλς, "the sea," and δρῦς, "an oak."

Halidrys *siliquosa*.—Fronds alternately bipinnate or tripinnate; pinnules very short, obtuse; vesicles mucronate, often terminated by a receptacle.

Halidrys *siliquosa*.—*Lyngb. Hyd. Dan.* p. 37; *Grev. Alg. Brit.* p. 9, t. 1; *Hook. Br. Fl.* vol. ii. p. 266; *Wyatt, Alg. Danm.* No. 53; *Endl.* 3rd Suppl. p. 30; *Harv.* in *Mack. Fl. Hib.* part 3, p. 168; *Harv. P. B.* plate 66; *Harv. Man.* p. 15; *Harv. Syn.* p. 12; *Atlas*, plate 1, fig. 3; *Harv. N. B. A.* part 1, p. 64; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 236.

Cystoseira *siliquosa*.—*Ag. Sp. Alg.* vol. i. p. 72; *Ag. Syst.* p. 287; *Spreng. Syst. Veg.* vol. iv. p. 317; *Grev. Fl. Edin.* p. 285.

Fucus *siliquosus*.—*Linn. Sp. Pl.* p. 1829; *Syst. Nat.* vol. ii. p. 716; *Fl. Lapp.* p. 365; *Gm. Hist.* p. 81, t. 2 B; *Fl. Dan.* t. 106; *Huds. Fl. Angl.* p. 574; *Lightf. Fl. Scot.* vol. ii. p. 921; *With. Ar. Brit. Pl.* vol. iv. p. 88; *Good. & Woodw.* in *Linn. Trans.* vol. iii. p. 124; *E. Bot.* t. 474; *Stack. Ner. Brit.* p. 8, t. 5; *Turn. Syn.* vol. i. p. 60; *Hist.* t. 159; *Esper, Ic. Fuc.* t. 8.

Fucus *siliculosus*.—*Stack. Ner. Brit.* t. 11.

Hab.—On rocks and stones in the sea to half-tide level. Perennial. Spring and winter. Very common on all our shores.

Geogr. Dist.—North Sea; Northern Atlantic.

Description.—Root, a large spreading conical disc, very hard and woody. Fronds two feet or more in length, more or less cylindrical at the base, and often half an inch in diameter, becoming narrower, compressed, and two-edged upwards, and from one to two lines in breadth, bi-tripinnate. Branches alternate, erecto-patent, two-edged, often changed into vesicles; these are large and conspicuous, linear oblong, mucronate, with thick walls, the cavity divided by numerous diaphragms, and traversed by several longitudinal filaments; lower pinnæ rather distant, often interrupted, or their place occupied by a vesicle; pinnules closer, more regular, and generally terminating in a pinnated raceme of vesicles

or *receptacles*. Receptacles at first ovate or lanceolate, at length linear oblong, loosely cellular, containing under the surface numerous spherical conceptacles, communicating with the surface by a minute pore, and having attached to their inner surface numerous oblong spores, rounded at the ends, somewhat contracted in the middle, and mixed with branched articulated filaments, bearing bright orange-coloured "antheridia." Structure : substance coriaceous, more or less woody in the older parts, scarcely adhering to paper. Colour, when young, a greenish olive, more or less brownish or olive-brown when old, blackish brown when dry.

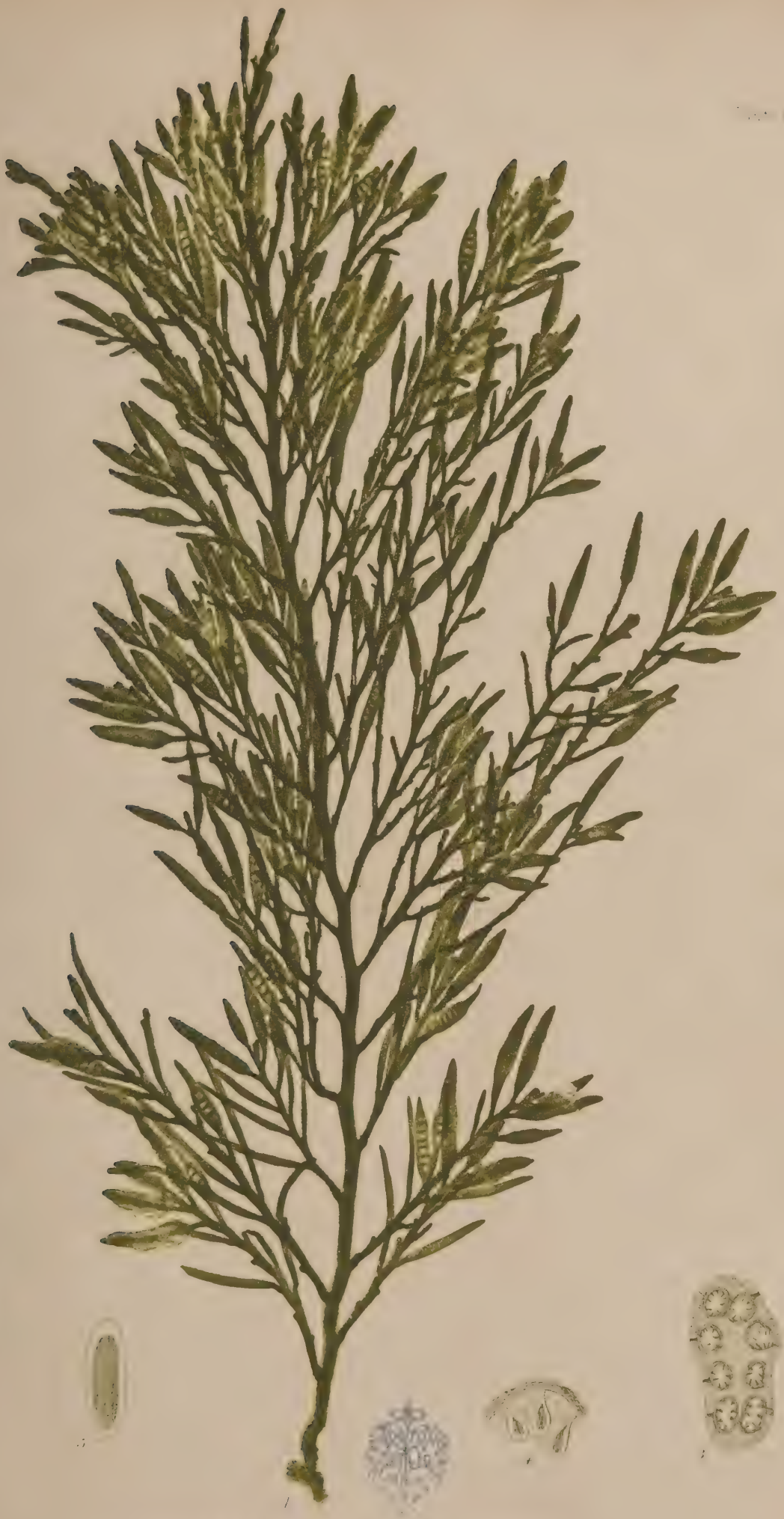
This fine species is readily distinguished from every other British Alga by the curious structure of its air-vessels, which are divided transversely by extremely thin membranous diaphragms, and these are curiously supported by very slender filaments, stretched from diaphragm to diaphragm, like the chords of a harp. When the specimens are fresh no constriction is visible externally, corresponding to these diaphragms; but as the air-vessels dry the diaphragm contracts, and a corresponding external constriction becomes very apparent. In old plants these constrictions are also frequently more or less visible. The air-vessels are frequently produced at the expense of a branch, and as the plant advances in its growth, often drop off or are removed by abrasion; hence the irregularity of the older pinnæ.

The genus *Halidrys* is neither numerous in species, nor widely distributed, being confined perhaps to the North Atlantic and its arms; but Professor Harvey mentions a very closely allied species, a native of the west coast of North America. The present species is very common on the British shores, both on the east and west coasts, between tides, but never exposed to be left dry, being in pools where it can always be covered by the tide.

In shallow pools it is often very stunted and dwarfish in all its parts, and in this state is very possibly the variety β of authors; but we have never seen the plant present so much variation as to deserve to be distinguished even as a variety, indeed the plant is remarkably constant to its character in every part.

EXPLANATION OF PLATE CXXX.

Fig. 1.—*Halidrys siliquosa*, natural size.
2.—Section of vesicle.
3.—Section of receptacle.
4.—Semisection of conceptacle.
5.—A spore. All magnified.



HALIDRYS SILIQUOSA. LYNGB.

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Plate CXXXI.

CYSTOSEIRA ERICOIDES.—*Ag.*

Gen. Char.—Frond very coriaceous, occasionally leafy at the base, slender and filiform upwards; air-vessels formed by inflation of the frond; receptacles terminal, very small, containing numerous spherical conceptacles, communicating with the surface by a minute pore, containing obovate spores attached to the inner surface, and mixed with antheridia. Name from κύστις, "a box or bladder," and σειρὰ, "a chain," because the air-vessels are continuous through the branches.

Cystoseira *ericoides*.—Frond stout, rigid, and woody in the older parts, repeatedly and irregularly branched, and everywhere beset with short spine-like processes; air-vessels minute, solitary, immersed in the branches near their apices; receptacles "cylindrical, armed with awl-shaped processes."

Cystoseira *ericoides*.—*Ag. Sp. Alg.* vol. i. p. 52; *Ag. Syst.* p. 281; *Spreng. Syst. Veg.* vol. iv. p. 316; *Grev. Alg. Brit.* p. 4; *Hook. Br. Fl.* vol. ii. p. 265; *Endl.* 3rd Suppl. p. 30; *J. G. Ag. Gen. et Sp. Alg.* vol. i. p. 221; *Harv.* in *Mack. Fl. Hib.* part 3, p. 167; *Harv. P. B.* plate 265; *Harv. Man.* p. 16; *Harv. Syn.* p. 13; *Atlas*, plate 1, fig. 4.

Halerica *ericoides*.—*Kütz. Phyc.* p. 354.

Fucus *ericoides*.—*Linn. Sp. Pl.* p. 1631; *Good. & Woodw.* in *Linn. Trans.* vol. iii. p. 130; *E. Bot.* t. 1968; *Turn. Hist.* t. 191.

Fucus *tamariscifolius*.—*Huds. Fl. Angl.* p. 576; *Stack. Ner. Brit.* p. 44, t. 11; *Turn. Syn. Fuc.* p. 88 (excl. syn. *Gmel.*)

Fucus *selaginoides*.—*Esper, Ic. Fuc.* vol. i. p. 69, t. 31 (excl. syn. *Gmel.*); *Good. & Woodw.* in *Linn. Trans.* vol. iii. p. 132; *Turn. Syn.* p. 85.

Hab.—On rocks and stones near low-water; also in tide-pools. Perennial. Summer and autumn. Common on the southern shores of England. Yarmouth (*Mr. Turner*); Ayrshire coast (*Dr. Landsborough*); Kintyre (*Dr. Curdie*); west of Ireland, common.

Geogr. Dist.—Atlantic shores of Europe; north of Africa.

Description.—Root, a large spreading disc, very slightly conical. Stem mostly solitary, six to eight inches long, and nearly half an inch in diameter, cylindrical, frequently rough and tubercled, branched towards the summit with stout tapering branches, bearing numerous bi-tripinnate branches, all the divisions of which are cylindrical, filiform, and distichous. The whole frond from near the base is everywhere beset with subulate spine-like processes, scattered, very erect, but not imbricated, "each furnished with a gland-like pore at its back." Structure cellular, cells of the periphery minute, forming dichotomous

moniliform series. Substance coriaceous, hard and woody in the older parts, not at all adhering to paper. Air-vessels minute, solitary, immersed in the substance of the branches near the apex. Receptacles "formed in the apices of the branches, oblong cylindrical, becoming nodose, always armed with spine-like ramuli, similar to those that clothe the branches;" "spores obovate, with wide borders." When growing under water, the frond reflects beautiful prismatic colours, which are lost when it is lifted into the air; the colour is then a yellowish olive.

The very appropriate name *ericoides* has been bestowed upon this species, from its shrubby and heath-like character of the fronds, both from their rigid substance and the small leaf-like processes which cover them. This shrub-like character is the more striking when the fronds grow erect as they sometimes do, and then the plant has perhaps more the appearance of a stunted miniature crab-tree than a straggling bush of heath, which it more nearly resembles in its leaf-like ramuli than in its general habit. This singular shrub-like character it retains even in the herbarium, but the peculiar character, for which it is most remarkable, and which renders it so much a gem in its native element, is the power it possesses of decomposing the rays of light, and reflecting all the colours of the rainbow.

Nothing could exceed the gorgeous brilliancy of these plants in their native rock-pools, especially when the water is slightly agitated. No pen or pencil could possibly do justice to the portraiture of this lovely gem when draped in all the richness of its lucid garniture. The most brilliant play of light of ever-varying tints of blue and green, of purple and azure, are rapidly and lavishly thrown from branch to branch as the fronds gently wave to and fro in the gentle swell. The play of light much resembles that observed in *Chondrus crispus*, *mamillosus*, and some others; but is infinitely more varied and beautiful. No sooner, however, has the plant been removed from the water, than all this gorgeous display of colouring vanishes, washed off as it were with the fluid which streams into the pool, and nothing remains but the plain and sombre tints of green and brown; even these disappear in the herbarium, and the term *nigrescens* would then be much more appropriate to its dull and lack-lustre hue.

EXPLANATION OF PLATE CXXXI.

Fig. 1.—*Cystoseira ericoides*, natural size.
2.—*a*, vesicle; *b*, receptacle.
3.—Section of receptacle.
4.—Section of conceptacle.
5.—A spore. All magnified.

Cystoseira ericoides. Ag.

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Plate CXXXII.

CYSTOSEIRA GRANULATA.—*Ag.*

Gen. Char.—Frond very coriaceous, occasionally leafy at the base, slender and filiform upwards; air-vessels formed by inflation of the frond; receptacles terminal, very small, containing numerous spherical conceptacles, communicating with the surface by a minute pore, containing obovate spores attached to the inner surface, and mixed with antheridia. Name from κύστις, "a box or bladder," and σειρὰ, "a chain," because the air-vessels are continuous through the branches.

Cystoseira *granulata.*—Stem scarcely divided; branches numerous, long, slender, and "quadrifarious," very much swollen at the base, repeatedly irregularly pinnate, or frequently dichotomous, beset, especially towards the summit, with spine-like ramuli; air-vessels small, contained in the branches, often forming an inflation below the axils.

Cystoseira *granulata.*—*Ag. Sp. Alg.* vol. i. p. 55; *Ag. Syst.* p. 282; *Grev. Fl. Edin.* p. 285; *Grev. Alg. Brit.* p. 5, t. 2; *Hook. Br. Fl.* vol. ii. p. 265; *Wyatt, Alg. Danm.* No. 101; *Endl.* 3rd Suppl. p. 30; *Harv.* in *Mack. Fl. Hib.* part 3, p. 167; *Harv. P. B.* plate 60; *Harv. Man.* p. 16; *Harv. Syn.* p. 13; *Atlas*, plate 2, fig. 5; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 217.

Fucus *granulatus.*—*Linn. Sp. Pl.* p. 1629; *Fl. Dan.* t. 591; *Turn. Hist.* t. 251; *E. Bot.* t. 2169; *Hook. Fl. Scot.* part 2, p. 94; *Lyngb. Hyd. Dan.* p. 58.

Fucus *concatenatus.*—*Linn. Sp. Pl.* p. 1629; *Huds. Fl. Angl.* p. 574; *Lightf. Fl. Scot.* vol. ii. p. 923; *Clem. Ess.* p. 310; *Velley, Pl. Man.* t. 2, f. 1.

Fucus *mucronatus.*—*Turn. Syn.* vol. i. p. 78.

Fucus *nodicaulis.*—*With. Br. Pl.* vol. iv. p. 111.

Phyllacantha *Boryana* (?).—*Kütz. Phyc. Gen.* p. 355 (and probably several other species of *Phyllacantha*, Kütz.).

Hab.—In rocky basins at and below half-tide level. Perennial. Summer. Common on the shores of England and Ireland; Jersey (*Miss White*).

Geogr. Dist.—Shores of Europe; from Norway to Spain.

Description.—"Root, a depressed conical disc." Stem cylindrical, simple, or once or twice divided, two to six inches or more in length, and three to four lines in diameter, everywhere beset from the base with long slender "quadrifarious" filiform branches, which are generally alternately bipinnate or tripinnate, frequently dichotomous, scarcely attenuated upwards, the branchlets of very irregular length and division,

beset, especially upwards, with short spine-like ramuli, which extend over the receptacles. Air-vessels scattered among the branches, single or two or three together, often subtending the axils, small and inconspicuous, elliptical. Substance coriaceous, very hard and woody in the older parts, and not adhering to paper. Receptacles linear lanceolate, unequally tubercular. Colour, a rather transparent olive green, almost black when dry.

This curious species is readily known from all the other British species by the curiously swollen bases of the branches, and more slender habit ; still, however, exhibiting the rigid, bushy, shrub-like habit of the genus. The whole genus might well be denominated the sea-shrubs of our shores ; they afford a striking and peculiar character to the marine vegetation in the warmer regions of the temperate zone, where they are chiefly found. They become rarer as we proceed northwards, most of the species reaching their northern limit before arriving at the British Isles, on the southern shores of which only they can be said to be frequent, scarcely any of them being found on our northern shores, where their place is supplied by the *Fuci*, which are rare in the south, and gradually increase in abundance as the *Cystoseiræ* diminish, until in the northern part of the temperate zone they entirely occupy their place.

The various species of *Cystoseira*, like their analogues on land, form a safe retreat and shelter for the vast myriads of marine animals that swarm in every pool during the summer months. Both Molluscs, Zoophytes, and Crustaceans seem to vie with each other in rendering them replete with life ; a single plant of *Cystoseira* would be an interesting subject of study almost for a life-time, while the details of habits and instincts of its varied inhabitants would supply ample materials to fill a volume.

EXPLANATION OF PLATE CXXXII.

Fig. 1.—*Cystoseira granulata*, natural size.
2.—Receptacle.
3.—Section of same.
4.—Semisection of conceptacle.
5.—Spores. All magnified.

Cystoseira granulata. Id.

Nature ... Vradoury

CYSTOSEIRA BARBATA.—*Ag.*

Gen. Char.—Frond very coriaceous, occasionally leafy at the base, slender and filiform upwards ; air-vessels formed by inflation of the frond ; receptacles terminal, very small, containing numerous spherical conceptacles, communicating with the surface by a minute pore, containing obovate spores attached to the inner surface, and mixed with antheridia. Name from κύστις, "a box or bladder," and σειρὰ, "a chain," because the air-vessels are continuous through the branches.

Cystoseira *barbata.*—Branches extremely slender, many times pinnate or subdichotomous ; receptacles small, elliptic or oblong, mucronate.

Cystoseira *barbata.—Ag. Sp. Alg.* vol. i. p. 57 ; *Ag. Syst.* p. 283 ; *Grev. Alg. Brit.* p. 6 ; *Hook. Br. Fl.* vol. ii. p. 265 ; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 223 ; *Harv. P. B.* plate 360 ; *Harv. Man.* p. 17 ; *Harv. Syn.* p. 14 ; *Atlas*, plate 2, fig. 8.

Fucus *barbatus.—Good. & Woodw.* in *Linn. Trans.* vol. iii. p. 128 ; *Turn. Syn.* p. 80 ; *Turn. Hist.* t. 250 ; *Sm. E. Bot.* t. 2170 ; *Stack. Ner. Brit.* p. 83, t. 14.

Fucus *fœniculaceus.—Gmel. Hist.* t. 2 A, f. 2 ; *Huds. Fl. Angl.* p. 575.

Hab.—Rocks between tide-marks. Said to have been gathered by Hudson in Devonshire ; but has not been recently found there.

Geogr. Dist.—Mediterranean, Adriatic, and Black Seas ; Brest (fide *Lenormand*).

Description.—Root, a flattened disc. Stem cylindrical, two or more inches in length, and one to two lines in diameter, simple or slightly divided, beset from the base with numerous long slender filiform branches, very much swollen at the base, and for a short distance unbranched, but covered with short spine-like processes, then repeatedly branched in an irregular and alternately pinnate manner ; branchlets erecto-patent, very slender, and scarcely swollen at the base. Air-vessels scattered among the pinnules contained in the branchlet, elliptic or lanceolate, single or two together. Substance coriaceous, very hard and woody when old, not at all adhering to paper. Colour greenish olive, almost black when dry. Receptacles small, lanceolate or oblong, with few spine-like processes or naked, and terminated by a short subulate mucro.

This very pretty species, we fear, has little claim to be considered a native of this country, although it is said to have been gathered on our southern shores many years ago ; but whether picked up on the

beach, or growing on the rocks, is uncertain, and as no record exists of its having been found there in recent times, it might be very properly omitted in the enumeration of British plants. Our only specimen was given us many years ago as British, but the label does not condescend to inform us where, or by whom, the accompanying specimen was collected, so that it is at least possible that it may be foreign, and as the specimen is well-fruited, this is not the less likely.

We are informed by Professor Harvey that Hudson says of it, "In Devoniæ *passim;*" should the *passim* however only refer to shore-picked specimens, it may be quite correct, and yet the plant not a native of the coast, as we have repeatedly found marine plants as well as animals thrown on shore now and then or after long intervals, although they have never been observed there in a living state. This is more likely to take place on the southern or south-western shores of England, where currents from the Atlantic shores of Europe may frequently deposit examples of the vegetation of these countries. And it is very possibly to these currents we owe some at least of the rarer plants of our southern shores, their spores having been carried thither by the currents from the south of Europe.

CYSTOSEIRA BARBATA.

EXPLANATION OF DISSECTIONS.

Fig. 1.—*a*, receptacle ; *b*, vesicle.
2.—Section of receptacle.
3.—Spores and filaments. All magnified.

Plate CXXXIII.

CYSTOSEIRA FÆNICULACEA.—*Ag.*

Gen. Char.—Frond very coriaceous, occasionally leafy at the base, slender and filiform upwards; air-vessels formed by inflation of the frond; receptacles terminal, very small, containing numerous spherical conceptacles, communicating with the surface by a minute pore, containing obovate spores attached to the inner surface, and mixed with antheridia. Name from κύστις, "a box or bladder," and σειρὰ, "a chain," because the air-vessels are continuous through the branches.

Cystoseira *fæniculacea.*—"Stem compressed; branches long, slender, rough with hard points, repeatedly dichotomo-pinnate; air-vessels small, solitary or two together, elliptical-oblong, placed near the tips of the branches; receptacles minute, smooth, linear-lanceolate."

Cystoseira *fæniculacea.*—*Grev. Alg. Brit.* p. 6; *Hook. Br. Fl.* vol. ii. p. 265; *Wyatt, Alg. Danm.* No. 51; *Harv. P. B.* plate 122; *Harv. Man.* p. 17; *Harv. Syn.* p. 15; *Atlas*, plate 2, fig. 7.

Cystoseira *discors.*—*Ag. Sp. Alg.* vol. i. p. 62; *Ag. Syst.* p. 284; *Spreng. Syst. Veg.* vol. iv. p. 317; *J. Ag. Alg. Medit.* p. 51; *Endl.* 3rd Suppl. p. 30; *Menegh. Alg. Ital. et Dalm.* vol. i. p. 83; *Mont. Fl. Alger.* p. 17; *Kütz. Phyc. Gen.* p. 358; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 224.

Cystoseira *abrotanifolia.*—*Ag. Sp. Alg.* vol. i. p. 63; *Ag. Syst.* p. 284; *Spreng. Syst. Veg.* vol. iv. p. 317; *J. Ag. Alg. Medit.* p. 52; *Endl.* 3rd Suppl. p. 30; *Menegh. Alg. Ital. et Dalm.* vol. i. p. 92; *Mont. Fl. Alger.* p. 19; *Kütz. Phyc. Gen.* p. 357.

Fucus *fæniculaceus.*—*Linn. Sp. Pl.* p. 1629; *Turn. Hist.* p. 252.

Fucus *discors.*—*Linn. Syst. Nat.* p. 717; *Turn. Syn.* p. 70; *Esper, Ic.* t. 26; *Stack. Ner. Brit.* t. 17; *E. Bot.* t. 2131; *Lamour. Ess.* p. 17.

Fucus *abrotanifolius.*—*Linn. Sp. Pl.* p. 1629; *Huds. Fl. Angl.* p. 575; *Stack. Ner. Brit.* p. 86, t. 14; *Turn. Syn.* p. 66; *E. Bot.* t. 2130; *Lamour. Ess.* p. 18.

Hab.—On rocks and stones in tide-pools near low-water. Perennial. Summer. Not uncommon on the southern shores of England. Isle of Wight; Jersey.

Geogr. Dist.—Atlantic shores of England, from the south of England to Spain; Mediterranean Sea.

Description.—"Root, a thick, hard, conical disc." Stem cylindrical at the base, compressed upwards, three to six inches in length, and one to two lines in diameter, rough, especially upwards, with spine-like protuberances, and beset with long slender filiform branches, rough like the stem, and generally naked in the lower part, repeatedly and irregularly

pinnate or subdichotomous. Air-vessels small, contained in the branchlets, and often subtending the axils. "The branches of young plants, and occasionally of the younger parts of the stem in old plants, are flat and leaf-like, bipinnate; the pinnules furnished with a midrib and muciferous pores, with a crenate or subdentate margin, and varying from a line to two or three lines in breadth."—*Phyc. Brit.* Receptacles oblong or lanceolate, frequently forked, without spine-like processes. Substance coriaceous, hard and brittle or subcartilaginous, not adhering to paper. Colour greenish olive in the younger parts, almost black when old or when dried.

We are very imperfectly acquainted with this species, and gladly follow Dr. Harvey in combining the two species of most authors, although we have not the variety referred to *F. discors*, and are unable to give any opinion of its character, whether as a species or variety.

It is one of our rarer species, being confined to the southern and south-western shores of England and the Channel Islands, and seems nowhere very abundant.

It may be readily distinguished from the other species of the genus by the smooth receptacles and the somewhat "compressed stem," as well as by the curious spine-like tubercles with which the stem and main branches are covered; these from their number would seem rather to be analogous to hairs, or at least to the setæ of some kinds of land plants, than to spines.

EXPLANATION OF PLATE CXXXIII.

Fig. 1.—*Cystoseira fœniculacea*, natural size.
2.—Branch with receptacles.
3.—Section of receptacle.
4.—Section of conceptacle.
5.—Spores and filaments. All magnified.

Cystoseira foeniculacea Grev.

Plate CXXXIV.

CYSTOSEIRA FIBROSA.—*Ag.*

Gen. Char.—Frond very coriaceous, occasionally leafy at the base, slender and filiform upwards; air-vessels formed by inflation of the frond; receptacles terminal, very small, containing numerous spherical conceptacles, communicating with the surface by a minute pore, containing obovate spores attached to the inner surface, and mixed with antheridia. Name from κύστις, "a box or bladder," and σειρὰ, "a chain," because the air-vessels are continuous through the branches.

Cystoseira *fibrosa*.—Stem compressed, much branched; branches long, slender, alternately bipinnate or tripinnate; pinnules densely set with slender setaceous ramuli; air-vessels single or two together, immersed in the branchlets; receptacles very long, linear or linear-lanceolate, more or less beset with setaceous ramuli.

Cystoseira *fibrosa*.—*Ag. Sp. Alg.* vol. i. p. 65; *Ag. Syst.* p. 285; *Spreng. Syst. Veg.* vol. iv. p. 317; *Grev. Alg. Brit.* p. 8; *Hook. Br. Fl.* vol. ii. p. 266; *Wyatt, Alg. Danm.* No. 52; *Endl.* 3rd Suppl. p. 30; *Fl. Dan.* t. 1902; *Harv.* in *Mack. Fl. Hib.* part 3, p. 168; *Harv. P. B* plate 133; *Harv. Man.* p. 17; *Harv. Syn.* p. 15; *Atlas*, plate 2, fig. 6 *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 226.

Phyllacantha *fibrosa*.—*Kütz. Phyc. Gen.* p. 356.

Fucus *fibrosus*.—*Huds. Fl. Angl.* p. 575; *Good. & Woodw.* in *Linn. Trans.* vol. iii. p. 137; *With. Br. Pl.* vol. iv. p. 87; *Stack. Ner. Brit.* p. 80, t. 14; *Turn. Syn.* vol. i. p. 93; *Turn. Hist.* t. 209; *E. Bot.* t. 1969; *Lamour Ess.* p. 18.

Fucus *abrotanoides*.—*Gmel.* p. 89; *Esper, Ic.* p. 108, t. 54.

Fucus *setaceus*.—*Huds. Fl. Angl.* p. 575.

Fucus *baccatus*.—*Gmel.* p. 90, t. 3, f. 2; *Esper, Ic.* p. 108, t. 54.

Hab.—On rocks and in tide-pools near low-water mark; also in deep water. Perennial. Summer. Common on the southern shores of England, and on the north, south, and west of Ireland.

Geogr. Dist.—Atlantic shores of Europe.

Description.—Root, a large, hard, expanded disc. Stem somewhat compressed, six to eight inches or more in length, one to two lines in thickness, nearly smooth, but furnished almost from the base with long, slender, filiform branches, two to three times alternately and sometimes irregularly pinnate; all the divisions more or less naked in their lower part, but furnished with a few scattered straggling spines, which are more numerous upwards, and on the ultimate pinnules are more

numerous, more slender and setaceous, and often forked and compressed. Mixed with the branches on the main stem are often to be observed "small linear, simple or forked, narrow compressed leaves, furnished with a midrib, and much attenuated towards the base and summit." Air-vessels are immersed in the ultimate branchlets, generally near their base; they are elliptical, rather large, single or in pairs, and are generally of a paler colour than the rest of the plants. Substance very hard and woody in the older parts, more tough and leathery in the younger, but not at all adhering to paper. Colour, a bright greenish olive, almost black when dry. Receptacles terminal, long, slender, linear or linear-lanceolate, beset with long, slender, setaceous spines.

All the species of *Cystoseira* seem to be ocean species with us, none of them being found either on the east coast of England or Scotland, and but rarely on that of Ireland, preferring those shores which are washed by the waters of the "*broad Atlantic*" to those laved by the German Ocean or the Irish Sea.

The present species is by no means an exception, as it is recorded as having been found all round the Irish coast, except on the eastern shores of the island, and we are not aware of any recorded habitat on the eastern shores of Great Britain.

It is one of the largest and handsomest of the genus, often growing to a length of several feet, and its long, slender branches, with their densely-tufted brush-like summits waving gracefully in the swell, "are exceedingly beautiful."

From the other species of the genus its long, slender receptacles readily distinguish it. These are often nearly an inch in length, and when young covered with setaceous ramuli, but when old these disappear, and the receptacles are nearly smooth.

EXPLANATION OF PLATE CXXXIV.

Fig. 1.—*Cystoseira fibrosa*, natural size.
2.—*a*, receptacle; *b*, vesicle.
3.—Leaf-like spine.
4.—Section of conceptacle.
5.—Tuft of antheridia. All magnified.

CYSTOSEIRA FIBROSA, Ag.

Nature Printed by Henry Bradbury.

Plate CXXXV.

PYCNOPHYCUS TUBERCULATUS.—*Kütz.*

Gen. Char.—Frond subcartilaginous, dichotomous, cylindrical; root fibrous; air-vessels innate; receptacles terminal, containing immersed spherical conceptacles, communicating with the surface by a terminal pore, and containing attached to their inner surface obovate spores mixed with antheridia. Name from πυκνὸς, "thick," and φύκος, "sea-weed."

Pycnophycus *tuberculatus.*—Frond simple or regularly dichotomous, with wide axils; receptacles terminal, linear, often subtended by a vesicle.

Pycnophycus *tuberculatus.*—*Kütz. Phyc. Gen.* p. 359 (1843); *Harv. P. B.* plate 89; *Harv. Man.* p. 18; *Harv. Syn.* p. 16; *Atlas,* plate 3, fig. 9.

Cymaduse *tuberculata.*—*Dne. Ann. Sc. Nat.* 1845, p. 12.

Fucus *tuberculatus.*—*Huds. Fl. Angl.* p. 588; *Good. & Woodw.* in *Linn. Trans.* vol. iii. p. 198; *Turn. Syn. Fuc.* vol. ii. p. 505; *Turn. Hist.* t. 7; *Esper, Ic. Fuc.* vol. ii. p. 20, t. 121; *E. Bot.* t. 726; *Lamour. Ess.* p. 20; *Stack. Ner. Brit.* Append.; *Ag. Sp. Alg.* vol. i. p. 98; *Ag. Syst.* p. 279; *Spreng. Syst. Veg.* vol. iv. p. 316; *Grev. Alg. Brit.* p. 18; *Hook. Br. Fl.* vol. ii. p. 269; *Harv.* in *Mack. Fl. Hib.* part 3, p. 169; *Harv. Man.* 1st ed. p. 21; *Wyatt, Alg. Danm.* No. 103; *Endl.* 3rd. Suppl. p. 29; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 204.

Fucus *bifurcatus.*—*With.* vol. iv. p. 109, t. 17, fig. 1.

Hab.—In rock-pools left on the recess of the tide near low-water mark, never growing in places which are dry at low water. Perennial. Summer and autumn. Coasts of Cornwall and Devonshire; Ilfracombe; Portland; north of Ireland. Common on the west coast of Ireland from Galway to Cork; Jersey.

Geogr. Dist.—Atlantic shores of France and Spain; coast of Barbary (*Web.* and *Mohr*); Cape of Good Hope (*Bowie* and *Dr. Harvey*).

Description. — Root composed of stout, creeping and interlacing fibres. Fronds much tufted, eight to twelve inches or more in length, two to three lines in diameter, cylindrical, with a naked stem for three to six inches, then regularly dichotomous or alternately subpinnate, with wide rounded axils; branches cylindrical, short, not tapering, terminated by the long, linear, tubercular receptacles, which generally terminate every branchlet, and are obtuse or very slightly tapering at each end, their structure similar to that of the stem, of which they are mere prolongations; the axis of rather large roundish oblong cells,

with a periphery composed of small roundish cellules, arranged in simple moniliform series; vesicles contained in the branchlets, often at the base of a receptacle, elliptical with thick walls. Substance coriaceous or subcartilaginous, and brittle when dry, not adhering to paper. Colour, a bright olive-green when fresh, dark olive or almost black when dry.

This curious Alga seems to have been very properly separated from the other species of the genus *Fucus;* although agreeing with them in external habit, it is considerably different in structure, being more closely allied in this respect to the preceding genera. Like them also it seems to be an ocean species, being confined to the south-west of England, and south and west of Ireland, on the shores of the latter country being rather plentiful, at least in several localities.

The question of the geographical distribution of species, both of marine and land plants, is one of great interest, and one well calculated to repay the trouble of investigation. It is not unlikely that the fact of so many of our rarer southern species being confined to the south-west of England and Ireland, is referable to the warmer current of the Atlantic from the south impingeing on these coasts, and thus keeping up a higher temperature than the latitude would otherwise indicate; on this also may depend the fact that the Algæ generally are more luxuriant in growth and more abundant in individuals as well as species on the west than on the east coast of our islands.

EXPLANATION OF PLATE CXXXV.

Fig. 1.—*Pycnophycus tuberculatus*, natural size.
2.—Portion of a receptacle.
3.—Transverse section of same.
4.—Section of conceptacle.
5.—Spore.
6.—Filaments. All magnified.

Pycnophycus tuberculatus. Kütz.

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Plate CXXXVI.

FUCUS VESICULOSUS.—*Linn.*

Gen. Char.—Frond coriaceous, internally composed of densely-packed, interlacing and anastomosing filaments, the periphery of radiating filaments, short, simple, and closely placed; air-vessels innate; receptacles terminal, or lateral and stalked, containing within the periphery spherical receptacles communicating with the surface by a minute pore, and containing attached to their inner surface obovate spores or stalked antheridia, "or both." Name from *φύκος*, "a sea-weed."

Fucus *vesiculosus.*—Frond linear, flat, dichotomous, with a stout midrib and entire margin; air-vessels elliptical, mostly in pairs, opposite, often wanting; receptacles much swollen, oblong or lanceolate.

Fucus *vesiculosus.*—*Linn. Sp. Pl.* p. 1626; *Linn. Fl. Lap.* p. 366; *Huds. Fl. Angl.* p. 576; *Lightf. Fl. Scot.* p. 904; *Stack. Ner. Brit.* p. 3, t. 2, and p. 12, t. 6; *Esper, Ic. Fuc.* p. 35, t. 12, 13, and p. 160, t. 83, 84; *Velley*, t. 1; *With. Br. Bot.* vol. iv. p. 84; *Gunn. Fl. Norv.* vol. i. p. 48; *Roth, Fl. Germ.* vol. iii. p. 442; *Turn. Syn.* p. 117; *Turn. Hist.* t. 88; *Lamour. Ess.* p. 18; *E. Bot.* t. 1066; *Lyngb. Hyd. Dan.* p. 3, t. 1; *Ag. Sp. Alg.* vol. i. p. 87; *Ag. Syst.* p. 275; *Grev. Crypt. Fl.* t. 319; *Grev. Alg. Brit.* p. 12, t. 2; *Hook. Br. Fl.* vol. ii. p. 267; *Wyatt, Alg. Danm.* No. 152; *Kütz. Phyc. Gen.* p. 351, t. 33–36; *Endl.* 3rd Suppl. p. 29; *Mont. Fl. Canar. Cell.* p. 139; *Mont. Fl. Alger.* p. 21; *Harv.* in *Mack. Fl. Hib.* part 3, p. 168; *Harv.* in *Bot. Beechey*, pp. 163, 406; *Harv. P. B.* plate 204; *Harv. Man.* p. 18; *Harv. Syn.* p. 17; *Atlas*, plate 3, fig. 10; *Harv. N. B. A.* part 1, p. 71; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 210.

Fucus *divaricatus.*—*Linn. Sp. Pl.* p. 1627; *Lightf. Fl. Scot.* p. 909; *Esper, Ic.* t. 11.

Fucus *inflatus.*—*Linn. Sp. Pl.* p. 1627; *Lightf. Fl. Scot.* p. 910.

Fucus *spiralis.*—*Linn. Sp. Pl.* p. 1627; *Stack. Ner. Brit.* t. 5; *E. Bot.* t. 1685; *Fl. Dan.* t. 286; *Huds. Fl. Angl.* p. 577; *Lightf. Fl. Scot.* p. 911.

Fucus *volubilis.*—*Huds. Fl. Angl.* p. 577.

Fucus *Sherardi.*—*Stack. Ner. Brit.* p. 72, t. 13; *J. Ag. Alg. Medit.* p. 46.

Fucus *linearis.*—*Huds. Fl. Angl.* p. 578.

Fucus *distichus.*—*Lightf. Fl. Scot.* p. 912 (not of *Linn.*).

Var. *β. subecostatus.*—Small, tufted, with a midrid scarcely discernible—rarely with vesicles.

Fucus *Balticus.*—*Ag. Sv. Bot.* t. 516; *Grev. Crypt. Fl.* t. 181; *Harv. P. B.* desc. plate 204; *Harv. Man.* p. 18.

Hab.—On rocks and stones left exposed at low-water, and extending up rivers while

the water remains brackish. Perennial. Summer and winter. Everywhere common. — β. In salt marshes occasionally flooded. Not uncommon.

Geogr. Dist.—Atlantic shores of Europe and North America; Mediterranean, Baltic, Icy Sea, White Sea; Iceland; Greenland; Nova Zembla; Spitzbergen; California; Sitka and Sachalin; Siberia; at Ochotsk and Kamtschatka; Canary Isles.

Description.—Root, a hard, spreading disc. Fronds from one to two feet or more in length, and nearly half an inch in breadth, with a strong percurrent midrib, occupying nearly one-fourth of its breadth, repeatedly and regularly dichotomous, frequently spirally twisted, the margin flat and very entire, the axils and apices broad and rounded. Air-vessels large, generally in single pairs, or forming a continuous line on each side of the midrib. Receptacles large, terminal, roundish ovate, oblong or lanceolate, containing within the periphery numerous spherical "conceptacles," which communicate with the surface by a minute pore, containing, attached to their inner surface, obovate spores or antheridia in different plants. Structure: the greater part of the frond is composed of delicate longitudinal anastomosing fibres closely packed together, and slightly coloured, the periphery very thin, consisting of vertical closely packed filaments, highly coloured, forming a kind of coriaceous epidermis much denser than the interior. Substance, when dry, very tough and leathery. Colour, when fresh, a fine deep olive green, when dry nearly black.

This is one of the most common as well as the most generally distributed species of the genus, having been found not only on all the northern shores of the Atlantic, but even on those of the Pacific, growing scarcer, however, as we proceed southwards, and in the southern part of the temperate zone probably disappears. In the northern Atlantic, however, it extends to a very high latitude: we have specimens from Baffin's Bay, collected in 73°, and it is said to be equally abundant along the northern shores of Siberia as far as the East Cape.

The variety β. *Balticus* is a most singular one, and such that no one would ever suppose, at first sight, that it had even the most distant affinity with the present species. It is an inhabitant of salt marshes, but does not generally grow, as far as our observation goes, in the water, but mostly in damp hollows, even among the thick grassy herbage, and round the margins of the pools. It is curious, however, to observe that although the greater number of the patches grow out of the water, yet of those that grow on the margin of the pools, those adjacent to the water are the most luxuriant; and we have a specimen just now before us, gathered near Fort George, on the shores of the Moray Frith, from the margin of a shallow pool, on the surface of which the plants forming the outer margin of the patch were partially

floating, which shows an unmistakeable affinity to the normal type of the species. There is no appearance of fructification, but the midrib on some of the branches is quite distinct, and these branches are much more straggling than the upright form of the variety, the ordinary habit of which is to grow in dense patches—so dense indeed, that the stems and branches are quite erect, and some force is required to separate them.

The species was one of those considered best suited for the manufacture of kelp. It is still very extensively employed along the sea coast as a manure; and on the shores of our northern counties and islands is much used as food for cattle during the winter months.

EXPLANATION OF PLATE CXXXVI.

Fig. 1.—*Fucus vesiculosus*, natural size.
2.—Lanceolate receptacles.
3.—Roundish receptacles with vesicles.
4.—Section of receptacle.
5.—Section of conceptacle.
6.—Spores and paraphyses. All magnified.

Fucus vesiculosus, LINN.

Nature-Printed by Henry Bradbury.

Plate CXXXVII.

FUCUS CERANOIDES.—*Linn.*

Gen. Char.—Frond coriaceous, internally composed of densely-packed interlacing and anastomosing filaments, the periphery of radiating filaments, short, simple, and closely placed; air-vessels innate; receptacles terminal, or lateral and stalked, containing within the periphery spherical receptacles communicating with the surface by a minute pore, and containing attached to their inner surface obovate spores or stalked antheridia, "or both." Name from *φύκος*, "a sea-weed."

Fucus *ceranoides*.—Frond submembranaceous, semitransparent, with a narrow midrib, repeatedly dichotomous; vesicles generally wanting; receptacles mostly borne on lateral dichotomous corymbs.

Fucus *ceranoides*.—*Linn. Sp. Pl.* p. 1626; *Fl. Lapp.* p. 366; *Stack. Ner. Brit.* p. 71, t. 13; *Good. & Woodw.* in *Linn. Trans.* vol. iii. p. 149; *Turn. Syn. Fuc.* vol. i. p. 136; *Turn. Hist.* t. 89; *E. Bot.* t. 2115; *Lyngb. Hyd. Dan.* p. 5; *Ag. Sp. Alg.* vol. i. p. 93; *Ag. Syst.* p. 277; *Grev. Alg. Brit.* p. 14; *Hook. Br. Fl.* vol. ii. p. 267; *Wyatt, Alg. Danm.* No. 154; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 209; *Kütz. Phyc. Un.* p. 352; *Sp. Alg.* p. 590; *Harv.* in *Mack. Fl. Hib.* part 3, p. 168; *Harv. P. B.* plate 271; *Harv. Man.* p. 19; *Harv. Syn.* p. 17; *Atlas*, plate 3, fig. 11; *Harv. N. B. A.* part 1, p. 70.

Fucus *distichus*.—*Esper, Ic. Fuc.* vol. ii. p. 62, t. 139 (excl. syn.).

Hab.—On rocks and stones between tide-marks; often in bays and estuaries. Perennial. Spring and summer. Common.

Geogr. Dist.—Atlantic shores of Europe; east coast of North America.

Description.—Root, a flattened somewhat conical disc. Frond about a foot in length or more, half an inch in breadth, repeatedly dichotomous, the axils and apices broad and rounded, midrib slender, very distinct and percurrent. Fructification lateral, on repeatedly dichotomous corymbs, which are either alternate, opposite, or secund, with very short branches; receptacles small, tapering to the apices, binate or forked. Substance thin, submembranaceous, and often much wrinkled or corrugated on the surface, generally without air-vessels, but not unfrequently the lateral margins of the frond are inflated from end to end, or with occasional interruptions, and the whole frond is often much spirally twisted.

We still retain this species, with some misgivings as to the propriety

of so doing. The lateral fructification and more membranous substance are characters which will seldom fail to distinguish the species; but we are not certain whether fresh water and exposure to the action of the air may not have much influence in changing the character of the species, at least as far as the substance of the frond is concerned: that founded on the fructification certainly seems at least to be of more importance.

Should this form, however, be considered deserving to retain its ground as a species, we are strongly inclined to think that *F. Balticus* would rank better with the present than with *F. vesiculosus*, as its substance, in its more perfectly developed forms, is very much the same, as are also to some extent the influences to which the two forms are subjected, and which are so peculiar that they cannot fail in having considerable power in altering the form of the species. Other species also seem to suffer similar changes from the same cause. A variety of *Rhodymenia palmata* we have found in brackish water, of large size, and having fronds soft and semitransparent, and much corrugated on the surface.

Fucus ceranoides, although not so common as *F. vesiculosus*, is by no means a rare species, being always found in estuaries, and where fresh-water streams mix with the sea, and occasionally in little muddy bays where it is long left by the tide; this is no reason, however, why the species should be retained, but rather the reverse; careful observation alone can decide the matter.

EXPLANATION OF PLATE CXXXVII.

Fig. 1.—*Fucus ceranoides*, natural size.
2.—Branchlet with receptacle.
3.—Section of same.
4.—Section of conceptacle.
5.—Spores and filaments. All magnified.

FUCUS CERANOIDES, LINN.

Nature Printed by Henry Bradbury.

Plate CXXXVIII.

FUCUS SERRATUS.—*Linn.*

Gen. Char.—Frond coriaceous, internally composed of densely-packed interlacing and anastomosing filaments, the periphery of radiating filaments, short, simple, and closely placed; air-vessels innate; receptacles terminal, or lateral and stalked, containing within the periphery spherical receptacles communicating with the surface by a minute pore, and containing attached to their inner surface obovate spores or stalked antheridia, "or both." Name from *φύκος*, "a sea-weed."

Fucus *serratus*.—Frond dichotomous, with a broad midrib, strongly serrated, the axils rather acute, the apices round, obtuse, or truncated; receptacles immersed in or near the apices of the branches, much compressed.

Fucus *serratus*.—*Linn. Sp. Pl.* p. 1626; *Fl. Lapp.* p. 365; *Fl. Suec.* p. 430; *Huds. Fl. Angl.* p. 576; *Lightf. Fl. Scot.* vol. ii. p. 902; *Stack. Ner. Brit.* p. 2, t. 1; *Turn. Syn.* vol. i. p. 110; *Turn. Hist.* t. 90; *E. Bot.* t. 1221; *Lyngb. Hyd. Dan.* p. 5, t. 1; *Ag. Sp. Alg.* vol. i. p. 95; *Ag. Syst.* p. 278; *Hook. Fl. Scot.* part 2, p. 95; *Grev. Fl. Edin.* p. 284; *Grev. Alg. Brit.* p. 15; *Hook. Br. Fl.* vol. ii. p. 267; *Wyatt, Alg. Danm.* No. 2; *Endl.* 3rd Suppl. p. 29; *Kütz. Phyc. Gen.* p. 352; *Harv.* in *Mack. Fl. Hib.* part 3, p. 169; *Harv. P. B.* plate 47; *Harv. Man.* p. 19; *Harv. Syn.* p. 18; *Atlas*, plate 3, fig. 12; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 211.

Hab.—On rocky shores at half-tide level. Perennial. Winter and spring. Very common.

Geogr. Dist.—Atlantic shores of Europe; Baltic; Greenland.

Description. — Root, a hard conical spreading disc. Frond one to two feet or more in length, shortly cylindrical at the base, much divided in a regularly dichotomous manner, with occasional lateral branches; midrib strong, gradually thinning into the flat margin, which is deeply and sharply serrated, the serratures slightly curved inwards, sometimes assuming the form of teeth or even laciniæ; axils rather acute, apices rounded or truncate. Receptacles formed of the apices of the midribs, slightly swollen, at length occupying the whole apex of the frond; conceptacles placed immediately under the periphery, spores obovate or roundish ovate, at length "finally separating into eight distinct sporules" (*Phyc. Brit.*); besides the spores the conceptacles contain numerous elongated jointed filaments or abortive spore-threads, and their inner surface is formed of concentric filaments, very densely packed, but we

have not been able to observe any tendency to arrange into vertical series, as in the periphery of the frond. Those which contain spores are of a yellowish green colour, those containing antheridia are of a bright yellow. Substance very tough and coriaceous, scarcely adhering to paper. Colour, a fine rich olive green, not changing much in drying.

The present is readily distinguished from all the other British species by its serrated margins, and the receptacles formed of, and continuous with, the divisions of the frond, from which they are not otherwise distinguishable than by their colour or more thickened substance, or a greater tendency to irregularity in outline, being often acute, bifid, or emarginate at the apices.

The present species is as common on all our shores as *F. vesiculosus*, but affects rather deeper water, and is not so long uncovered by the tide. It occupies a narrow zone from about half-tide level to nearly low-water. It presents very few varieties except in the length or breadth of its fronds, which vary from half an inch to nearly two inches in breadth.

The branching of the frond is regularly dichotomous, but occasional lateral innovations are found, and not unfrequently the serratures become compound. The midrib generally forks before the frond, so that the apices of the frond are often quite round and entire, whilst the midrib within presents forks of nearly an inch in length. Turner also mentions a variety in which the serratures are almost obsolete, and Greville has recorded another in which they have elongated into laciniæ.

This species is generally preferred for the purpose of exhibiting the zoospores in motion. For this purpose, fronds containing receptacles of a bright yellow colour are chosen, as these alone contain antheridia. A few of these receptacles placed while fresh in a dry box over-night or for an hour or two, will, when taken out, be observed dotted over with a bright orange very tenacious fluid ; these are the antheridia, and if placed in salt water under a microscope of considerable power, will be seen to consist of minute cells, from the open ends of which issue innumerable very minute animalcule-looking bodies of an obovate form, and which immediately commence frisking and sporting about in the most wonderful manner, with the greatest activity and velocity.

EXPLANATION OF PLATE CXXXVIII.

Fig. 1.—*Fucus serratus*, natural size.
2.—Apex of frond with receptacles.
3.—Section of receptacle.
4.—Section of conceptacle.
5.—Spores from same.
6.—Antheridia.
7.—Zoospores. All magnified.

Fucus serratus, LINN.

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Plate CXXXIX.

FUCUS NODOSUS.—*Linn.*

Gen. Char.—Frond coriaceous, internally composed of densely-packed interlacing and anastomosing filaments, the periphery of radiating filaments, short, simple, and closely placed; air-vessels innate; receptacles terminal, or lateral and stalked, containing within the periphery spherical receptacles communicating with the surface by a minute pore, and containing attached to their inner surface obovate spores or stalked antheridia, "or both." Name from *φύκος*, "a sea-weed."

Fucus *nodosus.*—Frond linear, compressed, without any distinct midrib, subdichotomous, or irregularly pinnate; branches very much attenuated towards the base, with minute, distant, alternate teeth; vesicles large, innate, elliptical, scattered over the frond; receptacles stalked, arising from the axils of the marginal teeth.

Fucus *nodosus.*—*Linn. Sp. Pl.* p. 1628; *Fl. Suec.* p. 431; *Fl. Lapp.* p. 366; *Lightf. Fl. Scot.* vol. ii. p. 918; *Huds. Fl. Angl.* p. 584; *With. Br. Pl.* vol. iv. p. 84; *Stack. Ner. Brit.* p. 35, t. 10; *Fl. Dan.* t. 146; *E. Bot.* t. 570; *Esper*, p. 25, t. 7, and p. 118, t. 60; *Gmel. Hist.* t. 1 B, f. 1; *Turn. Syn.* p. 252; *Turn. Hist.* t. 91; *Lamour. Ess.* p. 19; *Ag. Sp. Alg.* vol. i. p. 85; *Ag. Syst.* p. 275; *Hook. Fl. Scot.* part 2, p. 94; *Grev. Fl. Edin.* p. 284; *Spreng. Syst. Veg.* vol. iv. p. 316; *Grev. Alg. Brit.* p. 16; *Hook. Br. Fl.* vol. ii. p. 268; *Wyatt, Alg. Danm.* No. 154; *Endl.* 3rd Suppl. p. 29; *Harv.* in *Mack. Fl. Hib.* part 3, p. 169; *Harv. P. B.* plate 158; *Harv. Man.* p. 19; *Harv. Syn.* p. 19; *Atlas*, plate 4, fig. 13; *Harv. N. B. A.* part 1, p. 68; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 206.

Halidrys *nodosa.*—*Lyngb. Hyd. Dan.* p. 37, t. 8.

Physocaulon *nodosum.*—*Kütz. Phyc. Gen.* p. 352.

Ozothallia *vulgaris.*—*Dne.* in *An. Sc. Nat.* 1845, p. 13.

Hab.—On rocks and stones from high-water to half-tide level. Perennial. Spring and winter. Very common.

Geogr. Dist.—Atlantic shores of Europe and North America.

Description.—Root, a large, hard, spreading disc. Fronds much tufted, three feet or more in length, and about half an inch in breadth, compressed, and two-edged, without distinct midrib, several times dichotomously branched; branches very long, the margins marked by very shallow obtuse serratures, from which arise numerous short lateral branches, similar to the main branches, and very much attenuated to the base, the apices slightly tapering to an obtuse point; from the axils

of the teeth of these arise the receptacles, which are ovate or elliptical, elevated on short stalks, attenuated to their base, generally single, but often two or three from the same axil. Air-vessels very large, half an inch to an inch in diameter, formed at distant intervals by the inflation of the frond. Substance very tough and coriaceous, slightly adhering to paper. Colour, a bright olive-green, often almost dull yellow. The spores are at length separable into four sporules.

This is the largest species of the genus that is found on our shores, often reaching to the length of six or even eight feet in favourable localities; it grows the nearest to low-water of any of the genus, and when much exposed to light and air loses its fine olive-green colour, and becomes of a dull yellow, and changes to black when dry.

It is readily known from all the other species of the genus by its ribless or rather wingless fronds, or it would be better perhaps to describe them as consisting entirely of midribs without wings. The curiously stalked receptacles, arising, like the lateral branches, from the marginal teeth, supply good marks of distinction; indeed the whole habit of the plant is so totally different from that of the other species, that there can be no difficulty in distinguishing it. The air-vessels are very large, and often explode with a sharp report under the feet of the unwary collector; and boys often amuse themselves by throwing them in the fire, when the contained air, expanding by the heat, bursts the vesicle with a loud report.

It is perhaps the least liable to vary in its characters of any of the species, with the exception of being occasionally a little more or less stunted, according as it is more or less exposed to the action of the light and air.

EXPLANATION OF PLATE CXXXIX.

Fig. 1.—*Fucus nodosus*, natural size.
2.—Receptacle cut across.
3.—Section of conceptacle.
4.—Section of conceptacle with antheridia.
5.—Spores. All magnified.

Fucus nodosus. LINN.

Nature Printed by Henry Bradbury.

FUCUS MACKAII.—*Turn.*

Gen. Char.—Frond coriaceous, internally composed of densely-packed interlacing and anastomosing filaments, the periphery of radiating filaments, short, simple, and closely placed; air-vessels innate; receptacles terminal, or lateral and stalked, containing within the periphery spherical receptacles communicating with the surface by a minute pore, and containing attached to their inner surface obovate spores or stalked antheridia, "or both." Name from *φύκος*, "a sea-weed."

Fucus *Mackaii.*—"Frond cylindrical or subcompressed, slender, much branched; branches dichotomous; air-vessels elliptical, solitary; receptacles lateral, lanceolate-ovate or forked, stalked, pendulous, scattered near the base of the branches."—*Phyc. Brit.*

Fucus *Mackaii.*—*Turn. Hist.* t. 52; *Sm. E. Bot.* t. 1927; *Lamour. Ess.* p. 20; *Ag. Sp. Alg.* vol. i. p. 87; *Hook. Fl. Scot.* part 2, p. 95; *Grev. Alg. Brit.* p. 17; *Hook. Br. Fl.* vol. ii. p. 268; *Grev.* in *Phyc.* vol. i. p. 465; *Harv.* in *Mack. Fl. Hib.* part 3, p. 169; *Harv. P. B.* plate 52; *Harv. Man.* p. 19; *Harv. Syn.* p. 19; *Atlas*, plate 4, fig. 14.

Fucus *nodosus*, *γ Mackaii.*—*Ag. Syst.* p. 275; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 206.

Physocaulon *Mackaii.*—*Kütz. Phyc. Gen.* p. 352.

Hab.—Muddy shores, and among boulders. Perennial. April till June. North and west of Scotland; west of Ireland. Not uncommon.

Geogr. Dist.—North of Europe; Baltic.

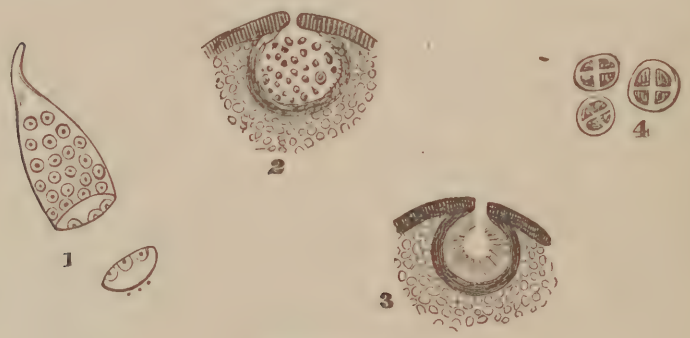
Description.—"Fronds growing in globular tufts, the size of a human head or larger, six to twelve inches long," one to two lines in diameter, linear, cylindrical or subcompressed, very much branched from near the base in an irregularly dichotomous manner, here and there pinnated with short, simple, or forked spreading branches. The branches are nearly cylindrical, scarcely tapering, erect, erecto-patent or patent, often trichotomous; the axils obtuse, but not much rounded, apices obtuse. Vesicles rather small, innate, elliptical, scattered through the frond at irregular distances. Receptacles elliptical lanceolate, single, in pairs or forked, pendulous, on slender cylindrical stalks, produced near the base of the main branches. Substance subcoriaceous, somewhat brittle, more or less adhering to paper. Colour, a dull yellowish olive.

We have not seen this species in the growing state, but judging from such characters as the dried plants afford, we must acknowledge that, to say the least of it, it is a very puzzling species.

There are not wanting characters sufficiently marked to separate it without much difficulty from *F. nodosus;* but whether these characters may prove permanent and not the result of accidental circumstances, is a different question, and one not so easily determined. The more cylindrical stems, the very different origin of the branches, the entire absence of the marginal teeth, the different fructification, are all characters which can be readily recognised and appreciated. Yet the general resemblance of the two species is such, combined with the singularly anomalous habitat of the species, as would naturally induce us to exercise caution in deciding the question without more careful observation of the species in their native habitats.

It is said to inhabit quiet, muddy, or stony bays, resting unattached on the muddy shore or among boulders, forming dense bundles of a more or less roundish form, and in this state to be tossed about at the mercy of the waves, and yet to produce fruit in abundance.

It would be very desirable to ascertain with certainty whether the plant may not be found in the vicinity in an attached state, and the anomalous forms, not merely such as have been detached by the violence of the waves.



FUCUS MACKAII.

EXPLANATION OF DISSECTIONS.

Fig. 1.—Receptacle cut across.
2.—Section of conceptacle with spores.
3.—Section of conceptacle with antheridia.
4.—Spores. All magnified.

Plate CXL.

FUCUS CANALICULATUS.—*Linn.*

Gen. Char.—Frond coriaceous, internally composed of densely-packed interlacing and anastomosing filaments, the periphery of radiating filaments, short, simple, and closely placed; air-vessels innate; receptacles terminal, or lateral and stalked, containing within the periphery spherical receptacles communicating with the surface by a minute pore, and containing attached to their inner surface obovate spores or stalked antheridia, "or both." Name from *φύκος*, "a sea-weed."

Fucus *canaliculatus.* — Frond linear, deeply channeled on one side repeatedly divided dichotomously; midrib and air-vessels none; receptacles terminal, binate or forked.

Fucus *canaliculatus.*—*Linn. Syst. Nat.* vol. ii. p. 716; *Fl. Dan.* t. 214; *Gmel. Hist.* p. 73, t. 1 A, f. 2; *Lightf. Fl. Scot.* p. 917; *Velley*, t. 1; *With. Br. Pl.* vol. iv. p. 99; *Turn. Syn.* p. 242; *Turn. Hist.* t. 3; *Sm. E. Bot.* t. 823; *Lamour. Ess.* p. 20; *Lyngb. Hyd. Dan.* p. 6, t. 1; *Ag. Sp. Alg.* vol. i. p. 96; *Ag. Syst.* p. 279; *Hook. Fl. Scot.* part 2, p. 96; *Grev. Fl. Edin.* p. 284; *Grev. Alg. Brit.* p. 18; *Hook. Br. Fl.* vol. ii. p. 268; *Wyatt, Alg. Danm.* No. 102; *Kütz. Phyc. Gen.* p. 352; *Harv.* in *Mack. Fl. Hib.* part 3, p. 169; *Harv. P. B.* plate 229; *Harv. Man.* p. 20; *Harv. Syn.* p. 20; *Atlas*, plate 4, fig. 15; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 204.

Fucus *excisus.*—*Linn. Sp. Pl.* p. 1627; *Mant.* p. 508; *Fl. Lapp.* p. 366; *Gunn. Fl. Norv.* vol. i. p. 96.

Pelvetia *canaliculata.*—*Dne. An. Sc. Nat.* 1845, p. 12.

Fucodium *canaliculatum.*—*J. Ag. Sp. Alg.* vol. i. p. 204.

Hab.—On rocky shores between high-water mark and half-tide level. Perennial. Summer and autumn.

Geogr. Dist.—Atlantic shores of Europe and North America.

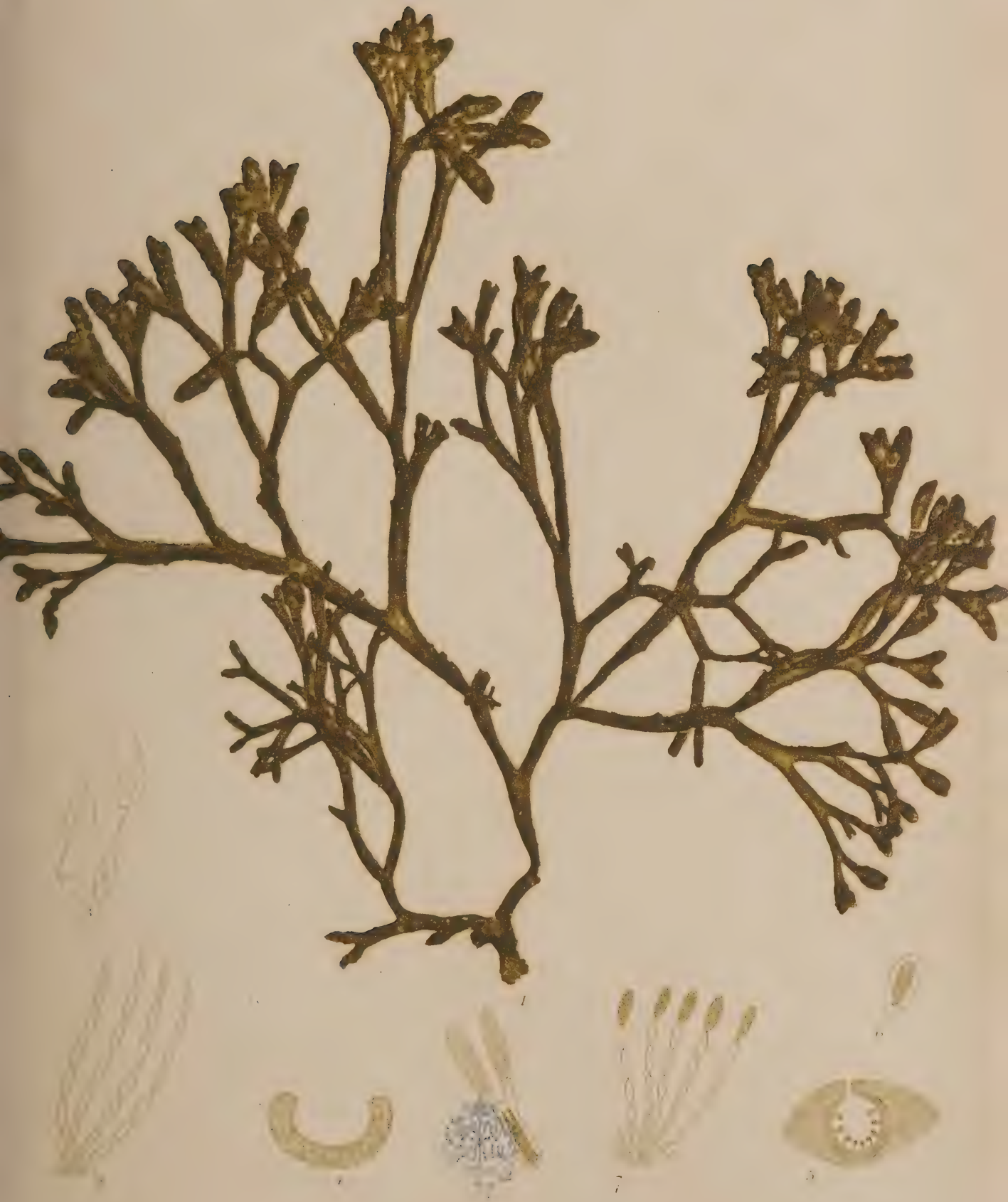
Description.—Root, a small conical disc. Fronds gregarious, tufted, two to five inches or more in length, one to two lines in breadth, repeatedly and regularly dichotomous, with occasional lateral innovations, generally without distinct midrib, but with the margins much thickened, and often so much incurved as to make the one side deeply channeled; the axils wide and rounded, the apices rather obtuse, bifid or forked. Receptacles terminal, oblong, lanceolate, either in pairs or deeply forked, tubercular; spores oblong, ovate, and separating transversely into two sporules. Substance very tough and leathery. Colour, a pale yellowish olive.

So patient is this species of drought that it may almost be considered amphibious. It makes its first appearance at or even a little above high water, where it can only be reached by the waves at the highest tides. Under such circumstances, in calm weather, the plants must often remain dry for days together, and in such cases must be quite dried up; yet when again covered by the tide they will imbibe the moisture, and to all appearance recover their vitality and growth.

It is curious and very interesting to observe the remarkable sensibility to light and air evinced by sea-weeds in their selection of a place of growth; some species, as *Griffithsia setacea*, are never found but in places which are shaded from the noonday sun, others form a narrow fringe round the margin of tide-pools, never reaching above six or eight inches from the surface, while some others, as *Phyllophora rubens* and *membranifolia*, delight to grow under the shade of these, screened from the direct rays of the sun, as well as from every eye except that of the enthusiastic collector. The present species, on the other hand, although *it would rather die* than live at a distance from the briny wave, yet is equally intolerant of more than a good bathe once or twice a-day. Hence, it never vegetates beyond a few inches under high-water, so that it can only be exposed for an hour or two, or at most three, to its influence at each tide. At high-water mark it may be observed growing at the base of the rocks, while as it recedes from the shore its zone ascends, or rather the rocks descend until they are below its level, and the plant disappears.

EXPLANATION OF PLATE CXL.

Fig. 1.—*Fucus canaliculatus*, natural size.
2.—Receptacles.
3.—Portion of same.
4.—Section of frond.
5.—Section of conceptacle.
6.—Spore.
7, 8.—Filaments from conceptacle. All magnified.



Fucus canaliculatus, LINN.

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Plate CXLI.

HIMANTHALIA LOREA.—*Lyngb.*

Gen. Char.—Frond at first obconical, at length top-shaped, expanding at the summit and cup-shaped, emitting from the centre one or more receptacles, which are elongate, compressed, dichotomous, with spherical conceptacles under the periphery, containing attached to their inner surface jointed filaments, which either produce antheridia or roundish cruciate spores on distinct plants. Himanthalia (*Lyngb.*) from ἱμὰς, "a strap," and θάλος, "a branch" (or ἅλς, "the sea").

Himanthalia *lorea.*—*Lyngb. Hyd. Dan.* p. 36, t. 8; *Grev. Fl. Edin.* p. 285; *Gaill.* in *Dict. Sc. Nat.* vol. liii. p. 357; *Grev. Alg. Brit.* p. 20, t. 3; *Hook. Br. Fl.* vol. ii. p. 269; *Wyatt, Alg. Danm.* No. 3; *Kütz. Phyc. Gen.* p. 351; *Endl.* 3rd Suppl. p. 29; *Harv.* in *Mack. Fl. Hib.* part 3, p. 170; *Harv. P. B.* plate 78; *Harv. Man.* p. 20; *Harv. Syn.* p. 20; *Atlas*, plate 4, fig. 16; *Harv. N. B. A.* part 1, p. 72; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 196.

Fucus *loreus.*—*Linn. Syst. Nat.* vol. ii. p. 716; *Gmel.* vol. ii. p. 1382; *Huds. Fl. Angl.* p. 583; *Lightf. Fl. Scot.* p. 920; *Fl. Dan.* t. 710; *With. Br. Pl.* vol. iv. p. 96; *Stack. Ner. Brit.* p. 37, t. 10; *E. Bot.* t. 569; *Turn. Syn. Fuc.* vol. ii. p. 246; *Hist.* t. 196; *Lamour. Ess.* p. 19; *Ag. Sp. Alg.* vol. i. p. 98; *Ag. Syst.* p. 280; *Spreng. Syst. Veg.* vol. iv. p. 316.

Fucus *elongatus.*—*Linn. Sp. Pl.* vol. ii. p. 1627 (excl. syn. *Moris*); *Syst.* vol. ii. p. 716; *Gmel.* vol. ii. p. 1381; *Gmel. Hist. Fuc.* p. 103 (excl. syn. *Huds.*).

Fucus *longo angustocrassoque folio.*—*Raii Syn.* p. 43, n. 11.

Fucus *fungis affinis.*—*Raii*, l. c. p. 43, n. 15.

Hab.—On rocks and stones near low-water mark. Biennial. Spring and winter. Common.

Geogr. Dist.—Atlantic shores of Europe; eastern coast of North America.

Description.—Root, a minute disc. Fronds densely aggregated when young, cylindrical or polygonal from mutual pressure, at length obconical, then expanding at the summit, and cup-shaped; the margin at length often recurved, one to two inches in length, and one to one and a-half in breadth. Receptacles, arising from the inside of the cup, two to four feet or more in length, about half an inch in breadth, repeatedly dichotomous, linear, compressed, but not two-edged; their apices more or less tapering to an obtuse point, containing, immersed throughout its whole length, spherical conceptacles, communicating with the surface by a minute pore, and having attached to their inner surface innumerable jointed filaments, which either produce roundish cruciate spores, or

antheridia, on distinct plants. Substance somewhat brittle when fresh, tough and coriaceous when dry, adhering to paper when young, rather imperfectly when old. Colour, a dark olive, almost black when dry. A variety is common with cylindrical fronds of a pale yellow colour.

This curious plant is one of the most common of our littoral Algæ. When young, the plants are densely gregarious or even cæspitose, and make their first appearance like a number of minute dots, about a line in diameter; these gradually elongate, squeezing each other into a polygonal form, by mutual pressure, until about an inch or so in length, sometimes covering a space of several square feet. We have never seen them fruited in this state, but either singly or in patches of from six to one or two dozen plants, so that the greater number of this dense mass must be removed, possibly by extreme lateral pressure, when their apices begin to expand, or by the vegetable feeding molluscs, or both. When the frond has reached its full length, the apex becomes depressed, the margin expands, and the whole assumes the form of a little cup, attached to the rock by a short stalk about an inch or an inch and a-half long, and the receptacle begins to protrude from the centre of the cup, or in old plants from any other part of the interior, in the form of a small pimple ; this rapidly elongates, forks a little above the base, and becomes slightly compressed, and repeatedly divides dichotomously until it reaches its full size, which some state at "twenty feet," but we have never seen it above five or six. The whole of this enormous receptacle is fertile, and drops off or is torn away by the force of the waves when it has reached maturity, but many of the cup-shaped fronds survive and produce fruit next year, perhaps repeatedly, but the receptacles never proceed from the same point in the cup, but from some other point in the interior. The cups of the first year, perhaps, only produce one receptacle ; those of future years may produce several, at all events old cups are often found with several receptacles arising from different parts of the inside of the cup.

EXPLANATION OF PLATE CXLI.

Fig. 1.—*Himanthalia lorea*, natural size.
2.—Portion of receptacle.
3.—Section of receptacle.
4.—Conceptacle with spores.
5.—Conceptacle with antheridia.
6.—Spores.
7.—Antheridia.
8.—Zoospores. All magnified.

Himantalia lorea LYNGB

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Plate CXLII.

DESMARESTIA LIGULATA.—*Lamour.*

Gen. Char.—Frond cartilaginous, cellular, composed of three strata of cells, surrounding a single-tubed jointed axis; cells of the inner stratum very minute, of the second rather large, those of the periphery very small; "producing, when young, marginal tufts of byssoid, branching fibres." Name in honour of A. G. Desmarest, a celebrated French Naturalist.

Desmarestia *ligulata.*—Frond compressed or flat, with a very obscure midrib, repeatedly pinnate; pinnæ and pinnulæ opposite, linear-lanceolate or elliptical, acute at each end.

Desmarestia *ligulata.*—*Lamour. Ess.* p. 25; *Grev. Alg. Brit.* p. 37, t. 5; *Hook. Br. Fl.* vol. ii. p. 273; *Wyatt, Alg. Danm.* No. 55; *Endl.* 3rd Suppl. p. 28; *Kütz. Phyc. Gen.* p. 343; *Harv.* in *Mack. Fl. Hib.* part 3, p. 172; *Harv. P. B.* plate 115; *Harv. Man.* p. 23; *Harv. Syn.* p. 21; *Atlas,* plate 5, fig. 17; *Harv. N. B. A.* part 1, p. 78; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 169.

Desmia *ligulata.*—*Lyngb. Hyd. Dan.* p. 33, t. 7.

Sporochnus *ligulatus.*—*Ag. Sp. Alg.* vol. i. p. 158; *Ag. Syst.* p. 261; *Grev. Fl. Edin.* p. 287; *Spreng. Syst. Veg.* vol. iv. p. 330.

Laminaria *ligulata.*—*Hook. Fl. Scot.* part 2, p. 99.

Fucus *ligulatus.*—*Lightf. Fl. Scot.* p. 946, t. 29; *Turn. Syn.* p. 99; *Turn. Hist. Fuc.* t. 98; *Sm. E. Bot.* t. 1636.

Fucus *herbaceus.*—*Huds. Fl. Angl.* p. 582.

Hab.—On rocks and stones in submarine pools, near low-water, and to a greater depth. Annual. Summer. Common.

Geogr. Dist.—European Atlantic; Cape Horn (*Dr. Hooker*).

Description.—Root, a broad conical disc. Frond from one to two feet in length or more, very variable in breadth, almost linear, linear-lanceolate, or broadly lanceolate or elliptical, and from half a line to an inch and a-half or even more, with a very short more or less cylindrical base, gradually becoming flattened or compressed; in the latter case with a very obscure midrib and two-edged, in the former with a midrib narrow but more distinct and pinnated, repeatedly pinnate almost from the base; pinnæ and pinnulæ distichous, very irregular in length, the smaller simple, the larger again pinnate, bipinnate, or even in very luxuriant specimens tripinnate; all the divisions similar in form to the main stem, being linear, linear-lanceolate, or even broadly lanceolate or elliptical, acuminate at the summit, and attenuated into a very narrow footstalk at

the base, the margins all more or less ciliated with minute subulate teeth, which when young are furnished with tufts of very delicate byssoid filaments.

This beautiful species is said to be not uncommon on all our shores. We have not met with it on the Forfarshire coast, although it is given in a list of Forfarshire Algæ, by Mr. Don.

The species of the genus *Desmarestia* differ so widely at different stages of their growth, that no one who has not traced them through their various stages would suppose for a moment that the rough, harsh, wiry-looking plants of autumn were identical with the beautifully light and delicate feathery-like fronds of early summer—so tender and delicate that they yield to the least movement in the water, forming the most graceful and beautiful curves as they rise and fall with the heaving swell.

Under the present species we would place the form *D. pinnatinervia*, our impression being that they are identical; although at first sight the great breadth of the frond, and the very narrow and distinct pinnated nerve, would indicate a distinct species.

We have not seen the variety in its native haunts, nor have we seen either of the forms in the young state. We have specimens of *D. pinnatinervia* collected in the north of Ireland from various correspondents, but are not aware if it has been met with elsewhere.

EXPLANATION OF PLATE CXLII.

Fig. 1.—*Desmarestia ligulata*, natural size.
2.—Pinna, narrow variety.
3.—Pinna, broad variety.
4.—Transverse section of stem. All magnified.

DESMARESTIA *ligulata*. LAMOUR.

Plate CXLIII.

DESMARESTIA ACULEATA.—*Lamour.*

Gen. Char.—Frond cartilaginous, cellular, composed of three strata of cells, surrounding a single-tubed jointed axis; cells of the inner stratum very minute, of the second rather large, those of the periphery very small; "producing, when young, marginal tufts of byssoid, branching fibres." Name in honour of A. G. Desmarest, a celebrated French Naturalist.

Desmarestia *aculeata.*—Frond linear, flattened, not two-edged, irregularly divided in a bi-tripinnated manner, very narrow and elongated; branches all attenuated at each end, ciliated when young with very delicate byssoid filaments, when old by suberect spine-like teeth.

Desmarestia *aculeata.*—*Lamour. Ess.* p. 25; *Grev. Alg. Brit.* p. 38, t. 5, f. 2, 3; *Hook. Br. Fl.* vol. ii. p. 273; *Wyatt, Alg. Danm.* No. 158; *Endl.* 3rd Suppl. p. 28; *Kütz. Phyc. Gen.* p. 343, t. 26, f. 1; *Harv.* in *Mack. Fl. Hib.* part 3, p. 172; *Harv. P. B.* plate 49; *Harv. Man.* p. 23; *Harv. Syn.* p. 22; *Atlas,* plate 5, fig. 18; *Harv. N. B. A.* part 1, p. 78; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 167.

Desmia *aculeata.*—*Lyngb. Hyd. Dan.* p. 34, t. 44 B, 1.

Sporochnus *aculeatus.*—*Ag. Sp. Alg.* vol. i. p. 151; *Ag. Syst.* p. 259; *Hook. Fl. Scot.* part 2, p. 96; *Grev. Fl. Edin.* p. 287.

Fucus *aculeatus.*—*Linn. Sp. Pl.* p. 1632; *Huds. Fl. Angl.* p. 585; *Lightf. Fl. Scot.* p. 924; *Fl. Dan.* t. 355; *Stack. Ner. Brit.* p. 24, t. 8; *Turn. Syn.* vol. ii. p. 262; *Turn. Hist.* t. 187.

Fucus *muscoides.*—*Linn. Sp. Pl.* p. 1630; *Huds. Fl. Angl.* p. 590

Hab.—On rocks and stones in the sea, and at low-water mark. Perennial. Common.

Geogr. Dist.—Atlantic shores of Europe; shores of Piedmont.

Description.—Root, a hard conical disc. Frond with a very short cylindrical stem, linear, compressed, the edges rounded, much branched, two to four feet or more in length, half a line to a line in breadth; branches bi-tripinnated, generally alternate, sometimes opposite, frequently two, occasionally three, arising from the same point, with which exception all are regularly distichous, long and slender, the lower ones very gradually tapering to an acute point, the upper very much attenuated to each end; all the divisions when young are beautifully fringed with very delicate jointed byssoid filaments, much branched in a regularly bi-tripinnate manner; pinnæ and pinnulæ opposite, regularly shorter upwards, forming a conical outline; when old fringed with

minute alternate spine-like teeth. Substance cellular, of three strata of cells, surrounding a slender jointed axial tube, that next the tube of few minute closely-packed oblong cellules, second of much larger oblong somewhat curved cells; the periphery of minute roundish cellules, very closely-packed, and having a tendency to arrange themselves into vertical filaments. Substance cartilaginous, very hard and rigid when old. Colour, when young, a fine olive green; when old, olive brown; when dry, blackish brown.

This beautiful species when about a foot in length (in the first or second week of May) is simply pinnate, everywhere fringed with delicate filaments of a pale green colour, and about a line and a-half in length, forming little pencil-like tufts along the margin of the frond; so delicate are these, that when the plant is taken out of the water they lie flat on the branches, and are not distinguishable from the main branches, and the whole looks like a rather stout slightly-branched *Cladophora*. As the plant advances in its growth, it becomes more branched, the branches more elongated without altering their width, the byssoid filaments gradually disappear, even at length from the summits, the whole becomes fringed with alternate minute spine-like teeth, and the plant has thus the appearance of harsh, rigid, somewhat flattened threads. In this state it is frequently thrown on shore in autumn in large bundles, often five to six feet in length.

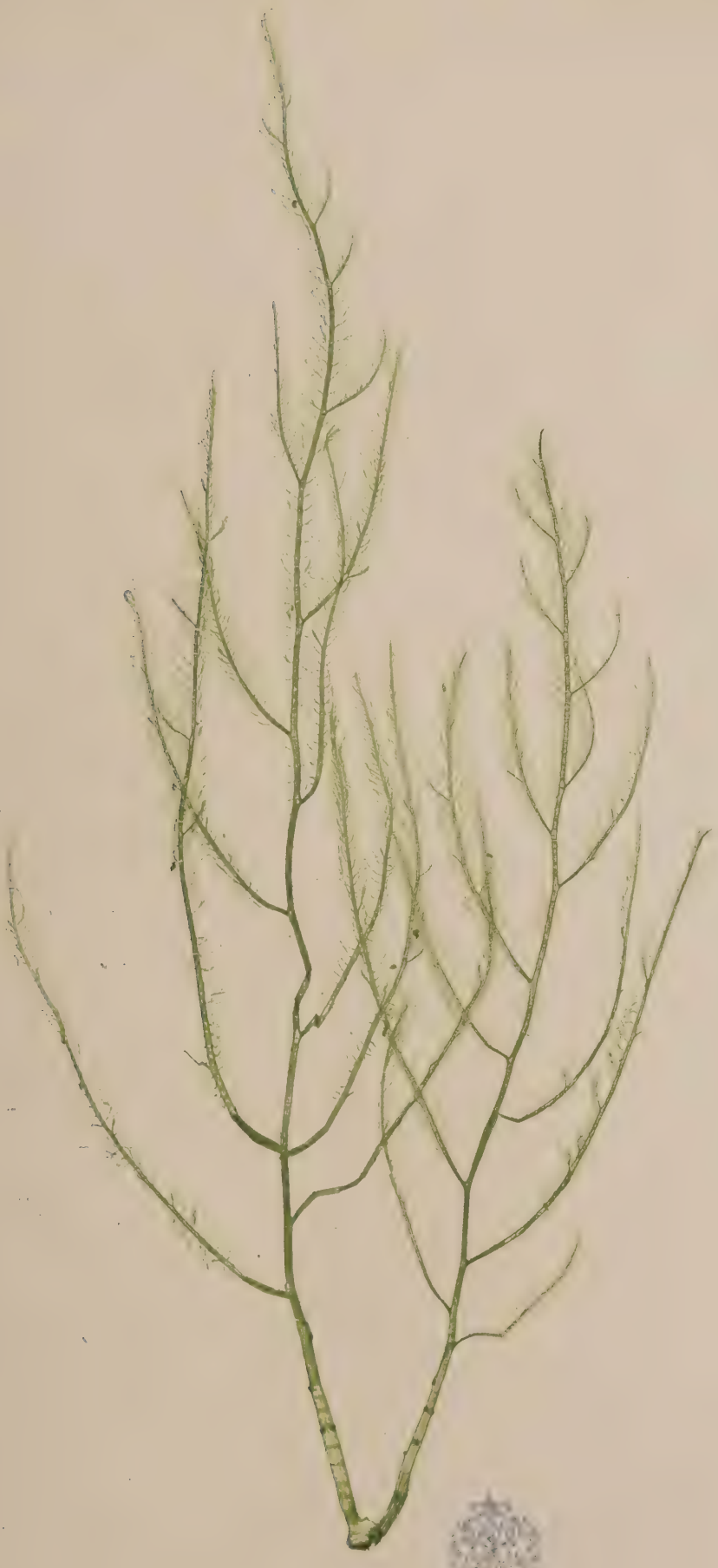
The young fronds are rarely if ever seen on the beach, and are only got by dredging in deep water, or occasionally in deep sheltered pools near low-water mark.

EXPLANATION OF PLATE CXLIII.

Fig. 1.—*Desmarestia aculeata*, natural size.
2.—Branchlet (old).
3.—Pinna from a byssoid filament of a young plant.
4.—Transverse section of a branch.
5.—Longitudinal section of same. All magnified.

DESMARESTIA ACULEATA, LAMOUR.
Winter.

Nature Printed by Henry Bradbury.



Desmarestia aculeata Lamour.

Summer.

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DESMARESTIA VIRIDIS.—*Lamour.*

Gen. Char.—Frond cartilaginous, cellular, composed of three strata of cells, surrounding a single-tubed jointed axis; cells of the inner stratum very minute, of the second rather large, those of the periphery very small; "producing, when young, marginal tufts of byssoid, branching fibres." Name in honour of A. G. Desmarest, a celebrated French Naturalist.

Desmarestia *viridis.*—Frond filiform, cylindrical, decomposito-pinnate; pinnæ and pinnulæ all opposite; young branches confervoid.

Desmarestia *viridis.*—*Lamour. Ess.* p. 25; *Endl.* 3rd Suppl. p. 28; *Kütz. Phyc. Gen.* p. 344; *Kütz. Sp. Ag.* p. 570; *Harv. P. B.* plate 312; *Harv. Man.* p. 24; *Harv. Syn.* p. 22; *Atlas*, plate 5, fig. 19; *Harv. N. B. A.* part 1, p. 77.

Dichloria *viridis.*—*Grev. Alg. Brit.* p. 39, t. 6; *Hook. Br. Fl.* vol. ii. p. 274; *Harv.* in *Mack. Fl. Hib.* part 3, p. 173; *Wyatt, Alg. Danm.* No. 56; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 164.

Sporochnus *viridis.*—*Ag. Sp. Alg.* vol. i. p. 154; *Ag. Syst.* p. 259; *Grev. Fl. Edin.* p. 287.

Chordaria *viridis.*—*Ag. Syn.* p. 14; *Hook. Fl. Scot.* part 2, p. 98.

Gigartina *viridis.*—*Lyngb. Hyd. Dan.* p. 44.

Fucus *viridis.*—*Fl. Dan.* t. 886; *Esper, Ic. Fuc.* t. 114; *Stack. Ner. Brit.* t. 17; *Turn. Syn.* vol. ii. p. 397; *Turn. Hist.* t. 97; *E. Bot.* t. 1669.

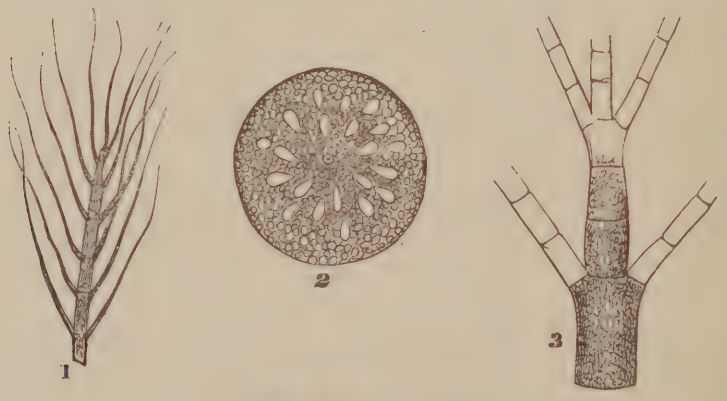
Hab.—On stones in the sea. Also on the larger Algæ, and extending to between tide-marks. Annual. Spring and summer. Common.

Geogr. Dist.—Atlantic shores of Europe and America; Northern Pacific; Southern and Antarctic Oceans.

Description.—Root, a minute disc. Frond filiform, cylindrical, one to two feet or more in length, and less than half a line in diameter, repeatedly branched in a regularly pinnated manner, all the parts opposite, gradually tapering upwards, and shorter, giving the frond an ovate outline; at first composed of a simple confervoid axial filament, which gradually becomes coated with successive layers of simple cellules, interspersed with several series of very large empty ones; those near the surface somewhat smaller. Substance rather soft and flaccid, closely adhering to paper. Colour, a fine brownish olive when fresh, passing into brownish orange when suffered to decay in salt water; but when removed from the water, and especially if left in contact with other Algæ, the colour soon changes to a deep verdigris green, often communicating the tint to the others.

We have followed Professor Harvey in retaining this curious species in the genus *Desmarestia*, without being perfectly satisfied that we have done right in so doing. It will be seen that it differs very considerably in structure as well as in habit from the other species of the genus, resembling them only in the delicate confervoid filament which forms the axis; the coating of minute cellules which surrounds it being greatly extended, and when a section is made near the base of the stem, occupying fully two-thirds of the radius, and being moreover abundantly interspersed with large roundish or oval cells which are empty, the remainder of the diameter being composed of much larger cells, becoming somewhat smaller towards the surface, but without the periphery of minute cells which characterises the other species of the genus. In the young state this coating of cells is moreover entirely wanting, the slender filaments being composed of the single-jointed filament of the axis, which gradually becomes covered by the cells as the plants advance in age.

Its remarkable property of changing colour is not one of the least curious circumstances in its history. This property we have seen it manifest in less than half an hour after removal from the water. Dr. Harvey has pointed out its resemblance to *Dictyosiphon*, and observes that they may be at all times distinguished by the constantly opposite branches of the present species.



DESMARESTIA VIRIDIS.

EXPLANATION OF DISSECTIONS.

Fig. 1.—Apex of young frond.
2.—Transverse section of the stem.
3.—Portion of stem partly covered by cellules. All magnified.

Plate CXLIV.

ARTHROCLADIA VILLOSA.—*Duby.*

Gen. Char.—Frond cellular, with an articulated tubular axis, filiform, cylindrical, jointed externally; the joints furnished with whorls of delicate branched, articulated filaments. Fructification: minute, moniliform pods, the joints of which at maturity are converted into elliptical spores. Name from ἄρθρον, "a joint," and κλάδος, "a branch."

Arthrocladia *villosa.*—Frond capillaceous, repeatedly pinnated, with long slender branches.

Arthrocladia *villosa.*—*Duby, Mem. Ceram.* p. 18 (1832); *J. Ag. Alg. Medit.* p. 43; *Endl.* 3rd Suppl. p. 25; *Kütz. Phyc. Gen.* p. 344; *Harv. P. B.* plate 64; *Harv. Man.* p. 24; *Harv. Syn.* p. 23; *Atlas*, plate 5, fig. 20; *Harv. N. B. A.* part 1, p. 75; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 163.

Elaionema *villosum.*—*Berk. Glean.* p. 49, t. 19, f. 3 (1833); *Harv. Man.* 1st ed. p. 28.

Sporochnus *villosus.*—*Ag. Sp. Alg.* vol. i. p. 155; *Ag. Syst.* p. 260; *Grev. Alg. Brit.* p. 42; *Hook. Br. Fl.* vol. ii. p. 274; *Wyatt, Alg. Danm.* No. 105; *Harv.* in *Mack. Fl. Hib.* part 3, p. 173.

Conferva *villosa.*—*Huds. Fl. Angl.* p. 603; *With. Br. Pl.* vol. iv. p. 141; *E. Bot.* t. 546; *Dillw. Conf.* t. 37; *Roth, Cat. Bot.* vol. iii. p. 314.

Hab.—On rocks, stones, shells, &c., in four to eight fathoms water. Rather rare. Annual. Summer and autumn. Southern coasts of England, not uncommon. Yarmouth (*Turner*); Anglesea (*Rev. H. Davies*); Frith of Forth (*Mr. Hassell*); Arthdur (*Capt. Carmichael*); Cumbraes (*Major Martin*); Wicklow (*Dr. Harvey*); Malahide and Carrickfergus (*Mr. M'Calla*); Jersey (*Misses White* and *Turner*).

Geogr. Dist.—Atlantic shores of Europe; Baltic and Mediterranean Seas.

Description.—Root, a minute disc. Frond "several from the same base," six to ten inches or more in length, capillaceous, bi-tripinnate, with opposite long slender patent branches, everywhere furnished with minute somewhat swollen joints, at a distance of nearly a line from each other, and these are furnished with whorls of from five to seven very delicate, repeatedly pinnated, byssoid, articulated, leaf-like branches. The structure of the frond itself is cellular, permeated by a rather wide tubular axis with very short joints, two to three times broader than long, and four or five of which are included within each of the external nodes; the cells next the axis are large, interspersed with smaller ones,

and gradually diminish in size towards the surface, where they are minute. Substance, "when fresh, cartilaginous, but soon becoming flaccid when removed from the water." Fructification: simple, elongated, moniliform pods (or stichidia), attached to the whorled filaments by a short footstalk, and containing at maturity, in each joint, an elliptical olive-coloured spore, "which at length bursts through the membrane and falls away." Colour, a fine transparent olive-green, rapidly changing to a dirty yellow in decay; adheres firmly to paper in drying.

This beautiful and delicate species is more common on our southern than on our northern shores, becoming rarer as we proceed northwards; and in Scotland is by no means common. The whorled filaments with which the joints of this species are furnished, are almost identical with those that fringe the fronds of *Desmarestia;* and Professor Harvey remarks, that the fructification of both genera is very likely of the same nature, although no fructification, so far as we are aware, has yet been observed on any species of *Desmarestia.*

We are informed by Dr. Greville, that Mr. Hassell observed "that this species had the property of rendering the paper on which it was spread, transparent for a short time. Most of the species of *Sporochnoideæ* have also the property of staining the paper of a fine brown colour, and rapidly decompose other delicate species with which they are left in contact after being removed from the water.

EXPLANATION OF PLATE CXLIV.

Fig. 1.—*Arthrocladia villosa*, natural size.
2.—Whorled branches of the stem.
3.—Pinnæ from same.
4.—Longitudinal section of stem.
5.—Transverse section of same.
6.—Sporiferous filaments. All magnified.

ARTHROCLADIA villosa. DUBY.

Lemon Printed by Henry Bradbury

VOL. III.

Plate CXLV.

SPOROCHNUS PEDUNCULATUS.—*Ag.*

Gen. Char.—Frond cylindrical, capillaceous, cellular; cells of the axis minute, the rest larger. Fructification: lateral stalked receptacles, terminated by a pencil of confervoid filaments, and composed of vertical, radiating, and branching filaments, bearing obovate spores. Name from *σπόρος*, "a seed," and *χνόος*, "wool."

Sporochnus *pedunculatus.*—Stem simple, percurrent, with numerous long simple branches.

Sporochnus *pedunculatus.*—*Ag. Sp. Alg.* vol. i. p. 149; *Syst.* p. 259; *Grev. Alg. Brit.* p. 41, t. 6; *Hook. Br. Fl.* vol. ii. p. 274; *Wyatt, Alg. Danm.* No. 104; *Endl.* 3rd Suppl. p. 28; *Kütz. Phyc. Gen.* p. 342; *Harv.* in *Mack. Fl. Hib.* part 3, p. 173; *Harv. P. B.* plate 56; *Harv. Man.* p. 25; *Harv. Syn.* p. 24; *Atlas*, plate 6, fig. 21; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 174.

Gigartina *pedunculata.*—*Lamour. Ess.* p. 48.

Fucus *pedunculatus.*—*Huds. Fl. Angl.* p. 587; *With. Br. Pl.* vol. iv. p. 120; *Stack. Ner. Brit.* p. 110, t. 16; *E. Bot.* t. 545; *Turn. Syn.* vol. ii. p. 367; *Turn. Hist.* t. 188.

Hab.—On rocks, stones, shells, &c., near low-water and to a greater depth. Rare. Annual. Summer and autumn. Eastern and southern coasts of England; Anglesea (*Rev. H. Davies*); Frith of Forth (*Mr. Hassell*); Kirkwall, Orkney (*Rev. Mr. Pollexfen*); Lamlash Bay, Arran (*Major Martin*); Bantry Bay (*Miss Hutchins*); Killiney (*Dr. Harvey*); Belfast Bay (*Mr. W. Thompson*); Malahide and Roundstone Bay (*Mr. M'Calla*); Jersey (*Miss White*).

Geogr. Dist.—Atlantic shores of France; British Islands.

Description.—Root, a minute disc. Frond six inches to a foot or more in length, with a simple and percurrent main stem, furnished from near the base with long simple branches, scattered, of nearly equal length, except towards the summit, where they become shorter to the apex; all cylindrical, capillaceous, and everywhere abundantly sprinkled with scattered receptacles, having sometimes a few even on the main stem. Receptacles at first resembling minute sessile warts; these soon elongate, become oblong, shortly stalked, and are tipped with a pencil of simple confervoid filaments; the structure consists of vertical branching filaments whorled round a fibrous axis, the branches of the filaments being converted into obovate spores. Structure (of the frond) cellular, about one-fourth of the diameter, of minute cellules, the remainder of

larger cells, rather smaller towards the surface, roundish angular. Substance cartilaginous, but soon becoming flaccid, closely adhering to the paper in drying. Colour, when fresh, greenish olive; when dry, greenish brown.

This fine and delicate species is of very limited geographical distribution, being rather scarce in Britain, and chiefly found in the southern portions of the country. On the coast of France it is also found, but still more rarely, and has not been met with out of Europe. Unlike some of our other rarer species, it seems to prefer the south-east rather than the south-west of these islands, and on the east coast has been found as far north as the Frith of Forth, but we have not seen or heard of its occurrence in Forfarshire.

It seems "to prefer old shells to rocks for its habitat, and rather deep sheltered pools or quiet bays, near low-water mark."

We have met with specimens having receptacles on the main stem, and these were of much larger size than those of the branches; and in most of our specimens the pedicels of the full-grown receptacles are longer than the receptacles.

EXPLANATION OF PLATE CXLV.

Fig. 1.—*Sporochnus pedunculatus*, natural size.
2.—Receptacles from base of stem.
3.—Receptacles from summit of stem.
4.—Apical filaments.
5.—Sporiferous filaments from receptacle. All magnified.

Sporochnus pedunculatus, Ag.

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CARPOMITRA CABRERÆ.—*Kütz.*

Gen. Char.—Frond linear, dichotomous, flat, with an indistinct midrib (or "filiform"), cellular; cells of the axis minute, of the rest larger; those of the periphery very minute. Fructification: "Mitriform receptacles terminating the branches, composed of horizontal branching filaments, whorled round a vertical axis, and producing elliptic oblong seeds."—*Phyc. Brit.*

Carpomitra *Cabrerœ.*—Frond linear, flat, with an indistinct midrib, dichotomous, "here and there constricted."

Carpomitra *Cabrerœ.—Kütz. Phyc. Gen.* p. 343; *Harv. P. B.* plate 14; *Harv. Man.* p. 26; *Harv. Syn.* p. 24; *Atlas*, plate 6, fig. 22; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 177.

Sporochnus *Cabrera.—Ag. Sp. Alg.* vol. i. p. 156; *Syst.* p. 260; *Grev. Syn.* p. 40; *Harv.* in *Mack. Fl. Hib.* part 3, p. 154; *Harv. Man.* 1st edit. p. 28; *Endl.* 3rd Suppl. p. 28.

Fucus *Cabrera.—Clemente, Ess.* p. 313; *Turn. Hist. Fuc.* t. 140.

Hab.—Very rare. Beach at Youghal, 1813 (*Miss Ball*); Plymouth Sound (*Rev. W. S. Hore, Dr. Cocks*).

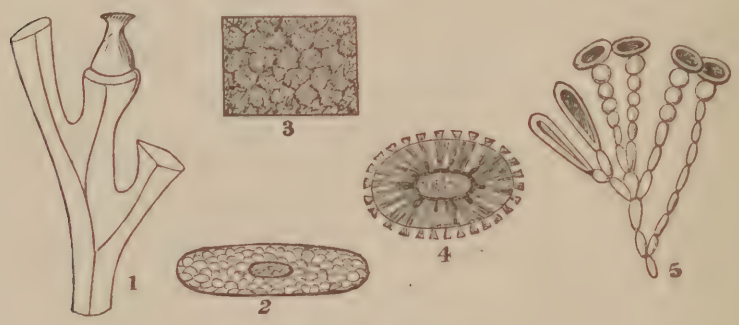
Geogr. Dist.—Cadiz (*Clemente*); south of Ireland; south of England.

Description.—Root, an irregularly oblong tuber, covered with woolly fibres. Fronds with an imperfectly percurrent main stem, irregularly pinnated or somewhat dichotomous, more or less rounded at the base, flattened upwards, with an indistinct midrib, especially in the lower part of the branches, less distinct upwards; branches more or less dichotomous, sometimes irregularly pinnated or even fascicled; upper branchlets quite flat, all linear, sometimes attenuated towards the base, or constricted, as if younger branches issued from the apices of the others in a proliferous manner. The midrib, composed of minute cellules, runs through the whole of the frond, but in the upper branches is scarcely apparent externally; it is surrounded by a stratum of larger cells, forming the main body of the frond, and that by a thin layer of minute cellules constituting the periphery. Substance cartilaginous, rather brittle when dry, imperfectly adhering to paper. Fructification "formed upon the thickened apex of the midribs of the branches, mitriform, minutely capitate, having a central, densely cellular cylindrical axis, round which branching, horizontal articulated filaments are whorled." "The lower joints of these filaments are slender, the upper beaded, and the terminal joint—which contains minute bodies, probably the remains of spermatozoa—oblately elliptical." "Spores pedicellate, linear elliptical, borne towards the base of the whorled filaments."—*Phyc. Brit.*

Our specimens of this curious plant are from Plymouth Sound, and have the fruit immature. We are not aware of the species having been found in a growing state in this country, although specimens have apparently been picked on the south-western shores of both England and Ireland in various places.

It is said (*Phyc. Brit.*) to be a native of Spain, on the authority of Clemente, but we are not aware if it has been found there in the growing state or picked on the beach, so that the real habitat of this curious plant is still imperfectly understood. Nor does the root (?), on any specimens we have seen or that of the figure in *Phyc. Brit.*, afford any clue to its nature; it appears to be only the swollen base of the stem adjacent to the real root.

It is said to be a native of the Southern Ocean, where several other allied species of the same genus occur.



CARPOMITRA CABRERÆ.

EXPLANATION OF DISSECTIONS.

Fig. 1.—Portion of frond with receptacle.
2.—Transverse section of frond.
3.—Surface of same.
4.—Section of receptacle.
5.—Filaments from same. All magnified.

Plate CXLVI.

ALARIA ESCULENTA.—*Grev.*

Gen. Char.—Frond stalked, flat, with a strong percurrent cartilaginous midrib. Fructification consisting of cruciate, obconical or pyriform tetraspores, forming a dense sorus, in small accessory ribless leaf-like pinnæ, attached to the upper part of the stalk. Name from *ala*, "a wing."

Alaria *esculenta*.—Frond much elongated, linear-lanceolate, with a thick, filiform, elliptical, percurrent midrib, continuous with the stem; accessory leaflets linear-obovate.

Alaria *esculenta*.—*Grev. Alg. Brit.* p. 25, t. 4; *Hook. Br. Fl.* vol. ii. p. 271; *Wyatt, Alg. Danm.* No. 203; *Post. & Rupp.* p. 11, t. 17; *Endl.* 3rd Suppl. p. 28; *Kütz. Phyc. Gen.* p. 347, t. 32, f. 1; *Harv.* in *Mack. Fl. Hib.* part 3, p. 171; *Harv. P. B.* plate 79; *Harv. Man.* p. 29; *Harv. Syn.* p. 25; *Atlas*, plate 6, fig. 23; *Harv. N. B. A.* part 1, p. 88; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 143.

Laminaria *esculenta*.—*Lyngb. Hyd. Dan.* p. 23; *Ag. Sp. Alg.* vol. i. p. 110; *Syst.* p. 269; *Hook. Fl. Scot.* part 2, p. 98; *Grev. Fl. Edin.* p. 282; *La Pylaie, Ann. Sc. Nat.* vol. iv. p. 178, t. 9, f. D—F; *Spreng. Syst. Veg.* vol. iv. p. 326.

Agarum *esculentum*.—*Bory, Dict. Class. Nat. Hist.* vol. ix. p. 194.

Fucus *esculentus*.—*Linn. Mant.* p. 135; *Fl. Dan.* p. 364; *Syst. Nat.* vol. ii. p. 718; *Gmel. Syst. Nat.* vol. ii. p. 1389; *Fl. Dan.* t. 417; *Lightf. Fl. Scot.* vol. ii. p. 938, t. 28; *Huds. Fl. Angl.* p. 578; *With. Br. Pl.* vol. iv. p. 93; *Turn. Syn. Fuc.* vol. i. p. 104; *Turn. Hist.* t. 117; *Eng. Bot.* t. 1759; *Esper, Ic. Fuc.* vol. ii. p. 30, t. 126.

Fucus *fimbriatus*.—*Gmel. Hist. Fuc.* p. 200, t. 29, f. 1.

Fucus *tetragonus*.—*Good. & Woodw.* in *Linn. Trans.* vol. iii. p. 140.

Fucus *teres*.—*Good. & Woodw.* in *Linn. Trans.* vol. iii. p. 140.

Fucus *pinnatus*.—*Fl. Norv.* vol. i. p. 96.

Fucus *Scoticus latissimus edulis dulcis*.—*Raii Syn.* p. 46, n. 30.

Hab.—On rocks and stones, at low-water mark. Perennial. Spring and winter. Common all round the shores of Scotland, and north and west of Ireland. Cumberland, Anglesea, Isle of Man, Durham and Northumberland; not uncommon. North coasts of Devonshire and Weymouth; but rather rare.

Geogr. Dist.—Common in the Arctic and Northern Atlantic Oceans; Iceland (*Lyngby*; Northern Pacific; Sitka; Kamtschatka; Atlantic shores of France (*Lenormand*).

Description.—Root composed of strong branching fibres. Frond three to four or even "twenty" feet in length. Stem cylindrical, three to ten inches or more in length, and four to six lines in thickness, naked when young, at length pinnated, especially near the summit, with small,

ribless, obovate leaflets, flat and obtuse, gradually tapering into a short cylindrical footstalk. The stem, slightly flattened and elliptical, is continued through the frond, which is thin, flat, linear-lanceolate, tapering into the stem at the base, and at the summit into a long narrow point, quite flat, or more or less crisped and folded, entire when young, but soon becoming more or less split up into numerous laciniæ. Structure consisting of roundish or hexagonal cells, very minute towards the circumference. Substance cartilaginous, closely adhering to paper, the older parts often woody. Fructification consisting of obovate or pyriform spores, closely packed into roundish spots or sori, vertically arranged on the accessory leaflets.

This fine species is abundant on all our northern shores, as well as on those of Northern Europe, Asia, and North America, becomes rarer as we proceed southwards, and appears to find its southern limit on the coast of France. It forms a narrow belt immediately beyond low water, preferring to be always covered, and is scarcely ever left bare by the tide, unless at spring-tides, and then only partially. It may at times be met with in shady pools, but such do not seem to be its favourite haunts, being possibly too warm for its thriving well; indeed it does not object to even the most exposed situations, often forming a dark brown fringe round the steepest and most exposed headlands on the coast, generally forming dense continuous masses, seldom associating much with other *Laminariæ*.

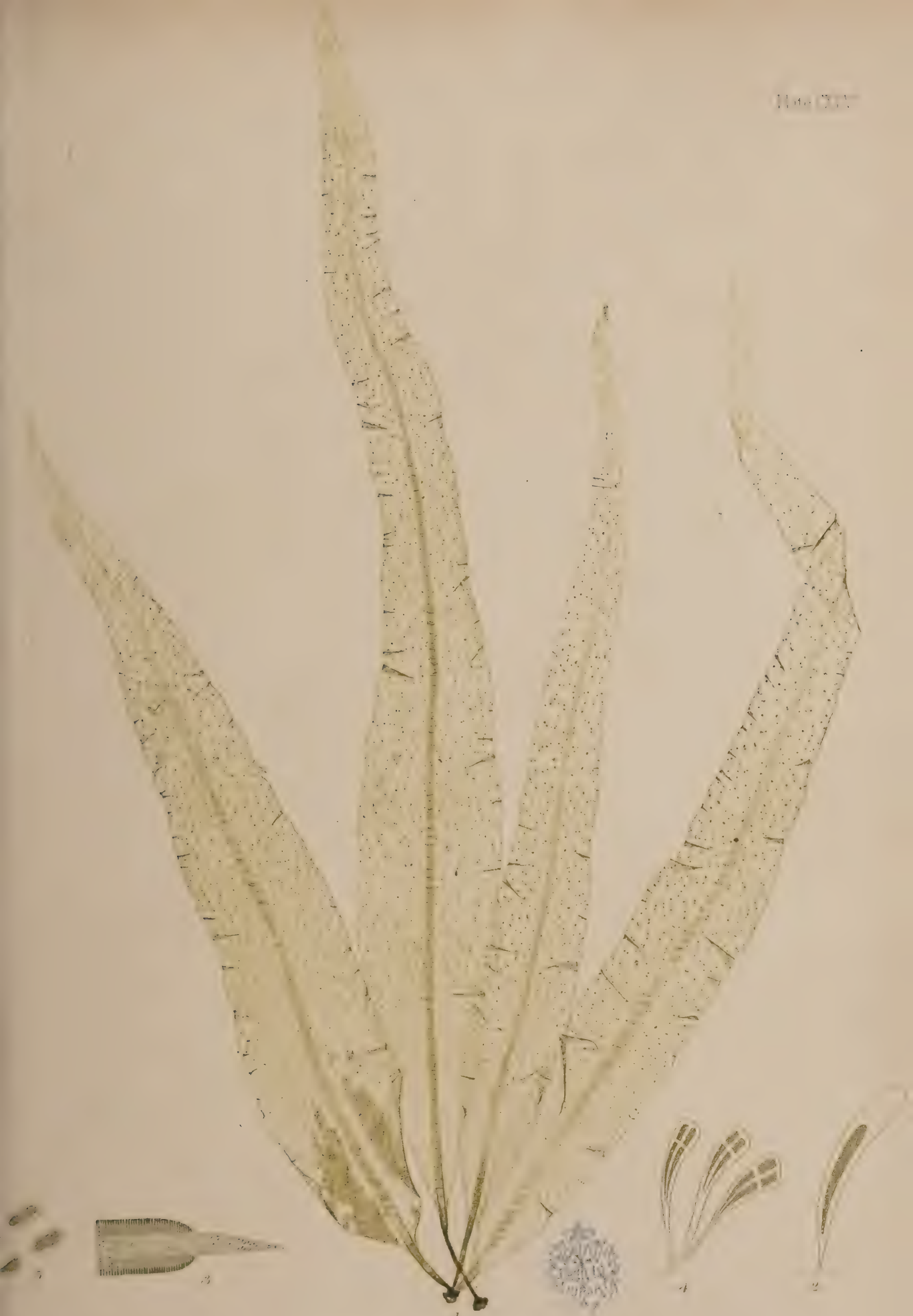
The accessory leaflets do not appear till the plants have reached a length of several feet, and are said to be renewed as well as the frond every year; the stem only being perennial, at the summit of which the new growth commences.

The membranous part of the frond is generally more or less waved and crisped, but sometimes very much so, even in the young state, and occasionally the crisping is all on the one side, in which case the frond is curved round in the form of a ring.

In several coast towns in Scotland it is frequently eaten by the people, and often hawked through the adjoining country for sale; and although no less abundant than the other edible species, generally sells at a higher price, owing to the difficulty of procuring it at low water at ordinary tides. The midribs, or occasionally the fruit-bearing leaflets, are the parts which are eaten.

EXPLANATION OF PLATE CXLVI.

Fig. 1.—*Alaria esculenta*, natural size.
2.—Fructiferous leaflet.
3.—Section of same.
4.—Tetraspores.
5.—Sporules. All magnified.



Alaria esculenta. Grev.
young.

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Plate CXLVII.

LAMINARIA DIGITATA.—*Lamour.*

Gen. Char.—Frond stalked, coriaceous or rarely membranaceous, flat, without a midrib. Fructification: spores collected in spots or sori under the surface of some part of the frond. Name from *lamina*, "a thin plate."

Laminaria *digitata.*—Stem elongated, woody when old, cylindrical at the base, slightly tapering upwards, suddenly expanding into an oblong flat frond, generally deeply torn into narrow linear or lanceolate segments.

Laminaria *digitata.—Lamour. Ess.* p. 22; *Lyngb. Hyd. Dan.* p. 20; *Ag. Sp. Alg.* vol. i. p. 112; *Ag. Syst.* p. 270; *Grev. Alg. Brit.* p. 27; *Hook. Br. Fl.* vol. ii. p. 271; *Wyatt, Alg. Danm.* No. 156; *Endl.* 3rd Suppl. p. 27; *Post. & Rupr.* t. 12; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 134; *Harv.* in *Mack. Fl. Hib.* part 3, p. 171; *Harv. P. B.* plate 223; *Harv. Man.* p. 29; *Harv. Syn.* p. 26; *Atlas*, plate 6, fig. 24; *Harv. N. B. A.* part 1, p. 94.

Laminaria *stenoloba.—De Lap. Terr. Neuv.* p. 55.

Hafgygia *digitata.—Kütz. Phyç. Gen.* p. 346, t. 30 and 31.

Fucus *digitatus.—Linn. Mant.* p. 134; *Fl. Dan.* t. 392; *Stack. Ner. Brit.* p. 5, t. 3; *Esper, Ic. Fuc.* p. 99, t. 48, 49; *Huds. Fl. Angl.* p. 579; *Lightf. Fl. Scot.* p. 935; *With. Br. Pl.* vol. iv. p. 98; *Linn. Trans.* vol. iii. p. 152; *Turn. Syn.* p. 207; *Turn. Hist.* t. 162; *E. Bot.* t. 2274.

Fucus *hyperboreus.—Gunn. Fl. Norv.* vol. i. p. 34, t. 3.

Hab.—On rocks and stones in the sea, from one to twenty fathoms. Perennial. Very common.

Geogr. Dist.—Northern Atlantic; Icy Sea; Kamtschatka.

Description.—Root consisting of numerous strong branching fibres, strongly adhering to the rocks by means of their flattened discs, and forming a conical or hemispherical mass, four to six inches in diameter. Stem two to four feet in length or more, one to one and a-half inch in diameter at the base, cylindrical, slightly tapering upwards, very rough and corrugated on the surface, solid and woody, suddenly expanding at the summit into a broad flat frond, two to four feet, or sometimes more, in length, and from six inches to a foot or more in breadth; quite entire when young, but at length split up into numerous narrow laciniæ, more or less torn or erose at the apices. Substance coriaceous, woody when old, closely adhering to paper by means of a tenacious substance which soon covers the surface when removed from the water. Colour, a

fine brownish olive; scarcely changing either by age or drying. Fructification, a dense stratum of minute angular spores, forming cloud-like spots or sori, immediately under the epidermis of the old fronds.

This species delights to grow in deep quiet bays, and generally prefers to grow in an erect position, being rarely found attached to the sides of the rocks. In such situations it often forms vast miniature submarine forests, under the shelter and shade of which millions of vegetable and animal beings find protection and enjoyment.

The long flexible fronds bend over by their own weight, they seldom appear above water, except at spring-tides, when the upper part of the stem may be seen with its broad frond gracefully turned over and hanging by its side, or slowly rising and falling with the swell, the stems often loaded with bundles of *Rhodymenia palmata*, *Delesseria alata*, and other smaller Algæ, and the fronds often dotted with multitudes of molluscs of various kinds.

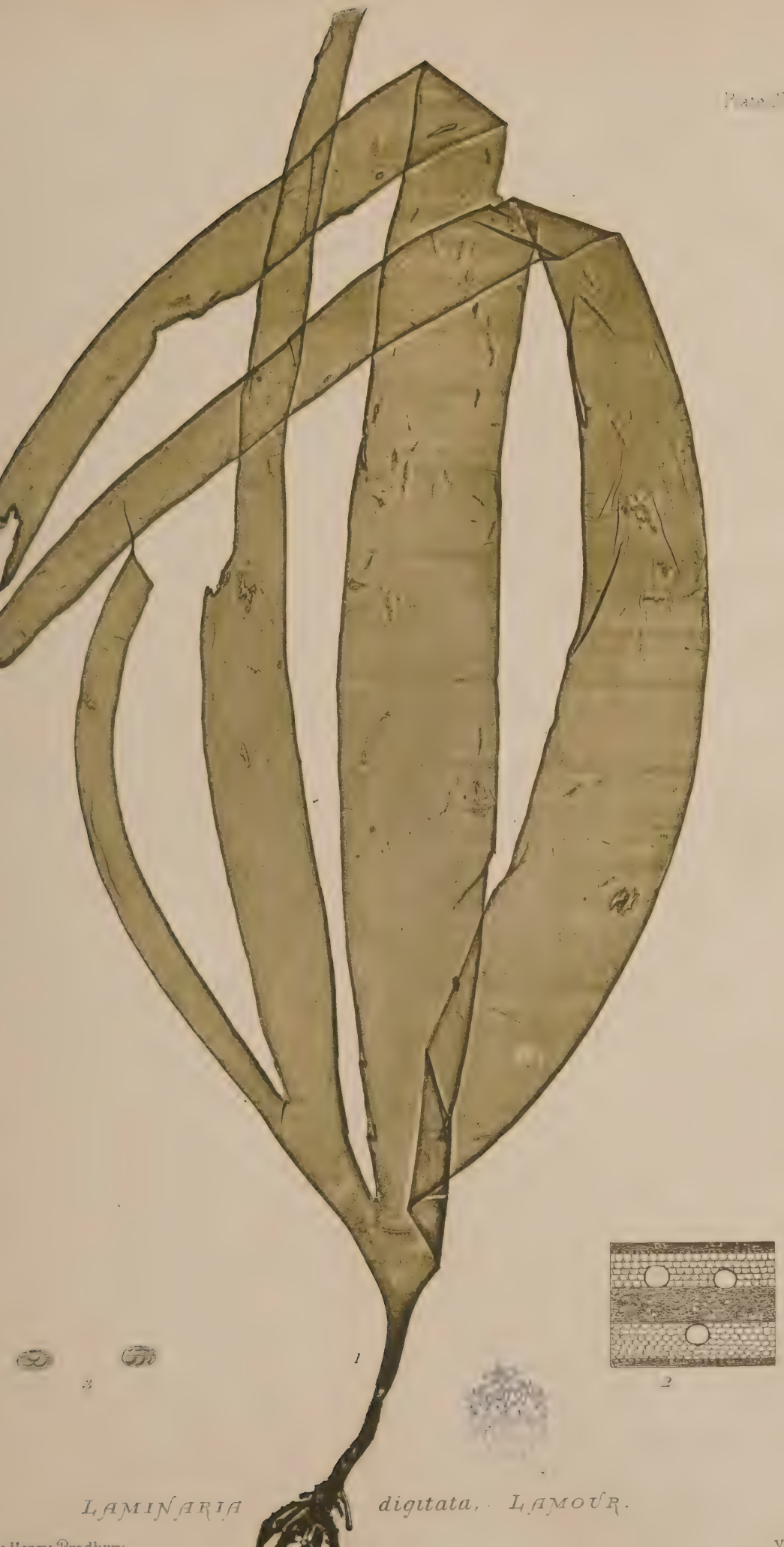
The stems of this species, under the name of "Cracker-heads," are often eaten by those who live near the sea, the lower part of the stem or even the roots being preferred by some, but it is never exposed for sale along with the other edible species, nor have they, so far as we are aware, been used for food in any part of Scotland for some centuries past.

We very rarely find this species growing on the perpendicular sides of rocks, yet we have occasionally seen it growing there, and *L. stenophylla* is sometimes found growing erect, but most frequently horizontally. There can never be any difficulty, however, of distinguishing the one from the other, as the smooth, dark-coloured, more or less compressed stems of the one may be known at a glance from the cylindrical, corrugated, pale brown stems of the other; and these characters, so far as our observations go, hold good at every stage of their growth, the smallest specimens having the lower part of the stem at least corrugated, a very small portion of the summit being generally smooth. The stems of this species are eaten at every age, being rather brittle and cartilaginous, while those of *L. stenophylla* are only eaten when young, the old stems being tough and coriaceous, and very insipid; indeed the people on some parts of the coast reject the latter altogether, alleging that it is quite unfit for eating.

The old stems of *L. digitata* are occasionally made into handles for knives, &c., being, when dry, almost as hard as horn.

EXPLANATION OF PLATE CXLVII.

Fig. 1.—*Laminaria digitata*, young frond, natural size.
2.—Section of frond.
3.—Spores. Both magnified.



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LAMINARIA digitata. LAMOUR.

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LAMINARIA DIGITATA, *var.* STENOPHYLLA.

Laminaria *stenophylla.*—Stem elongate, cylindrical at the base, flattened upwards, smooth and polished, of a dark brown colour; frond narrow, tapering at the base.

Laminaria *digitata*, var. *stenophylla.*—*Harv. Phyc. Brit.* pl. 338; *Harv. Syn.* p. 26; *Atlas*, plate 7, fig. 25.

Hafgygia *digitata*, var. *stenophylla.*—*Kütz. Sp. Alg.* p. 577.

Laminaria *conica.*—*Bory, Dict. Cl. d'Hist. Nat.* vol. ix. p. 190.

Hab.—Common on the shores of the north of Scotland and Ireland.

Description.—Root, a conical mass of strong branching fibres, strongly adhering by their flattened discs. Stem one to four or more feet in length, and half an inch to an inch in breadth, more or less cylindrical at the base, compressed upwards, and somewhat widened, with, when old, a dark brown, smooth, and glossy surface, never corrugated, tough and coriaceous, gradually widening into a narrow linear frond, several feet in length, and two to four inches in breadth, split when old into numerous narrow laciniæ.

In Scotland this species or variety is universally known in town and country by the name of Tangle, and is eaten in the young state with considerable relish by those who are accustomed to it, being generally mixed, when it can be had, with the dulse (*Rhod. palmata*) which are hawked about for sale. It is only when the stems are from eight to ten inches in length, however, that they are so used. When above that size they are rejected as being too tough and leathery; so tough are the stems of this species, that when partially dried they can be readily tied into knots or plaited like cords.

The stems of *L. digitata* always stand erect or nearly so, even if removed from the water, while those of the present bend over, even from the base; so much so, that the stem as well as the frond readily swing about in the swell.

This form appears to be no less common than the preceding, inhabiting quiet tide-pools, often attached to smooth stones in large clusters.

Plate CXLVIII.

LAMINARIA BULBOSA.—*Lamour.*

Gen. Char.—Frond stalked, coriaceous or rarely membranaceous, flat, without a midrib. Fructification: spores collected in spots or sori under the surface of some part of the frond. Name from *lamina*, "a thin plate."

Laminaria *bulbosa.* — Stem flattened, with a thin waved margin, narrowed upwards; root, a broad, hollow warted tuber, with few, mostly simple roots; frond oblong or ovate, split into narrow laciniæ; fructification collected in sori, mostly in the waved margin of the stem.

Laminaria *bulbosa.*—*Lamour. Ess.* p. 22; *Ag. Syn.* p. 18; *Lyngb. Hyd. Dan.* p. 21; *Hook. Fl. Scot.* part 2, p. 99; *Ag. Syst.* p. 271; *Ag. Sp. Alg.* vol. i. p. 114; *Grev. Alg. Brit.* p. 29; *Hook. Br. Fl.* vol. ii. p. 271; *Wyatt, Alg. Danm.* No. 4; *Harv.* in *Mack. Fl. Hib.* part 3, p. 171; *Harv. P. B.* plate 241; *Harv. Man.* p. 30; *Harv. Syn.* p. 26; *Atlas*, plate 7, fig. 26.

Laminaria *Belvisii.*—*Ag. Sp. Alg.* vol. i. p. 115; *Ag. Syst.* p. 271.

Saccorhiza *bulbosa.*—*De la Pyl. Fl. Ter. Neuv.* p. 23; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 137.

Haligenia *bulbosa.*—*Dne. Ess.* p. 50; *Endl.* 3rd Suppl. p. 27.

Phycocastanum *bulbosum.*—*Kütz. Phyc. Gen.* p. 346.

Fucus *bulbosus.*—*Huds. Fl. Angl.* p. 579; *Linn. Trans.* vol. iii. p. 153; *Turn. Syn.* p. 212; *Esper, Ic.* t. 123; *E. Bot.* t. 1760; *Turn. Hist.* t. 161.

Fucus *polyschides.*—*Lightf. Fl. Scot.* p. 936; *With. Br. Pl.* vol. iv. p. 97; *Stack. Ner. Brit.* t. 4.

Fucus *palmatus.*—*Gmel.* t. 40.

Ulva *bulbosa.*—*DC. Fl. Fr.* vol. ii. p. 16.

Hab.—On rocks and stones from low-water mark to the depth of twenty fathoms. Perennial. Autumn. Very common.

Geogr. Dist.—Shores of Europe; Norway to Spain; Faroe Islands; Coast of Guinea: Pal. de Beauvois.

Description.—Root, in the young state of the plant, composed of several clasping fibres, gradually perishing as the frond increases in size, and its place supplied by a hollow tuber, which originates at a higher point of the stem. "Stem, at first slender and filiform, half a line in diameter, and an inch in height, with a small dilatation like a collar a little above the middle, gradually becoming broader and quite

flat, till, in large specimens, it is four or five feet long, and two or three inches wide, with the margin very much waved and curled."—*Phyc. Brit.* In full-grown plants the primary root seems to have disappeared, "the collar-like expansion" having become much extended, forming a hollow flattened disc, throwing out small mostly simple rootlets from its under side and edges, which fix themselves to the rock and supply the place of the primary root. Substance subcoriaceous, rather flaccid when fresh. Colour, a greenish olive, darker in the older parts. Fructification: minute spores, collected into sori, mostly in the waved margins of the stem, and occasionally over the lower portion of the frond; they are oblong or elliptical, arranged vertically, and closely packed together in dense sori, immediately under the surface of the part in which they originate.

This species differs considerably in habit from the other species of the genus, but surely not so much as, in a small genus like the present, to render it desirable to form a new one for its reception. The disappearance of the first root and the formation of a new one, is a curious and interesting feature in its history, and the flattened, winged stem is a character no less remarkable than peculiar, but the character derived from the fructification is not by any means constant, the sori being frequently scattered over the surface of at least the lower part of the frond, and possibly at times over the whole of it, as in the other species of *Laminaria*.

The fronds of this species often grow to an immense size; so large, that when spread out they have been found to "cover a space of twelve feet diameter."

It is said to be abundant on the British shores, and is given in Don's List of Forfarshire Algæ, but we have not met with it, nor have we heard of its recent occurrence there.

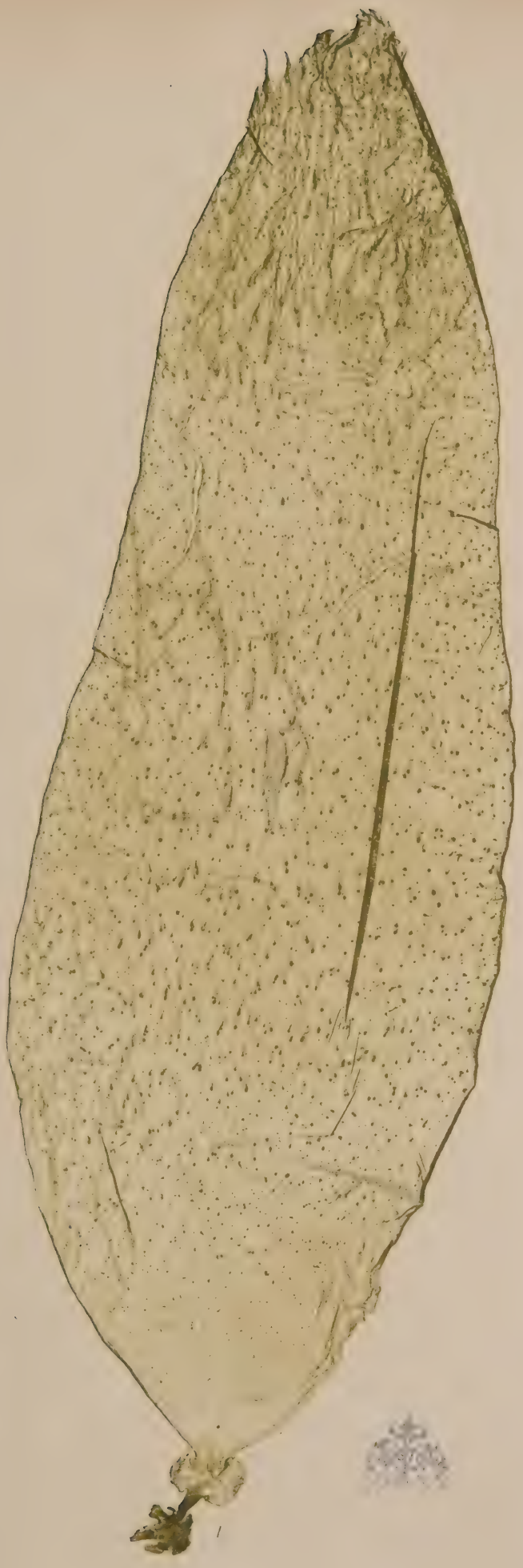
The formation of a second root is perhaps a provision in this species, rendered necessary by its immense size; when full grown requiring a much broader and stronger holdfast than the first root could be capable of producing, or at least of producing in sufficient time for rendering it due support; the lower part of the stem becoming hardened by age and growing more slowly, some new process is necessary to give it security and strength by fixing the point of support at a higher part of the stem.

The splitting of the frond in this genus does not seem to be a natural but an artificial process, and to be caused by the constant action of the waves; hence the edges have generally a torn appearance, and the apices of the laciniæ are always erose, from the circumstance of the frond being renewed every year from the summit of the stem, where the growth commences, and the old frond often remaining attached

to the young until it has grown to a size much larger than that of its predecessor, and from which it is at length separated by the constant lashing of the waves. This old frond is separated from the new one by a narrow constriction, and is generally fringed, tipt, or occasionally completely covered by parasitical Algæ, such as *Ectocarpus siliculosus*.

EXPLANATION OF PLATE CXLVIII.

Fig. 1.—*Laminaria bulbosa*, young frond, natural size.
2.—Transverse section of same.
3.—Spores. Both magnified.



Laminaria Bulbosa. Lamour.

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LAMINARIA LONGICRURIS.—*De la Pyl.*

Gen. Char.—Frond stalked, coriaceous or rarely membranaceous, flat, without a midrib. Fructification: spores collected in spots or sori under the surface of some part of the frond. Name from *lamina*, "a thin plate."

Laminaria *longicruris*.—"Stipes very long, slender at the base, hollow and inflated in the middle, and gradually tapering to the apex," cylindrical and smooth, suddenly expanding into an ovato-lanceolate, membranaceous, obtuse, much crisped frond; root of many branching fibres.

Laminaria *longicruris*.—*De la Pyl. An. Sc. Nat.* vol. iv. p. 177, t. 9, f. A.; *Fl. Ter. Neuv.* p. 41; *Post. & Ruppr. Illustr.* p. 10; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 135; *Kütz. Sp. Alg.* p. 576; *Harv. P. B.* plate 339; *Harv. Syn.* p. 27; *Atlas*, plate 7, fig. 27; *Harv. N. B. A.* part 1, p. 93.

Laminaria *ophiura*.—*Bory, Dict. Class.* vol. ix. p. 198.

Hab.—Cast ashore at Orkney; Gamnie, Banffshire; Ayrshire coast; near Dunluce Castle, Antrim; but all of them much worn, evidently stray waifs from a foreign shore.

Geogr. Dist.—Spitzbergen (*Vahl*); Baltic (*Agardh*); Newfoundland (*De la Pylaie*); and along the American shore to Cape Cod (*Dr. Harvey*); Bahamas (*Chauvin*); Kamtschatka (*Postells* and *Rupprecht*).

Description.—Root consisting of many rather slender, branching fibres, proceeding from the lower part of the stem for a distance of seven inches from the base, and securely attached by their flattened extremities. Stem tubular, five to six feet in length or more, slender and flexible at the base, gradually thickening upwards to the middle or to a point about one-third from the summit, then again tapering to the summit, cylindrical; diameter from an inch to an inch and a-half in the widest part, flattened at the apex, and suddenly expanding into the frond, which is obtuse or even somewhat cordate at the base, somewhat widened to the middle, then gradually forming a widely rounded lanceolate obtuse apex, the whole margin very much crisped and plaited like some specimens of *L. saccharina*, or rather like *Ulva linza*; in some specimens the outline is roundish ovate, in others, broadly lanceolate or lanceolate, four to five feet or more in length, and one to two in breadth; but very variable in length and width. Substance membranaceous. Colour of the stem pale brown, of the frond more greenish olive.

This beautiful and, although large, yet very delicate species we fear

has no claim to be considered a native of this country; indeed it has never been really published as such, but only in the hope that it might prove to be so, by its being found to be a native of some of the remote bays of some of our northern islands. Of this we fear, however, there is little hope, as all the fragments that have hitherto appeared on our shores have evidently been stray waifs from a far country.

It is said to be abundant along the northern shores of Asia, Norway, the Faroe Isles, and North America. On those of the Old World, however, it seems to become scarce after entering the temperate zone, while on the shores of America it does not reach its southern limit till it has reached Cape Cod in the United States (*Phyc. Brit.*). In the present species the roots are much more slender than those of the last, although the plant itself is larger, but the long flexible stem of this species enables it to follow the motion of the waves with but little strain on the root, whilst in *L. bulbosa* the short stiff stem and large broad frond produce a powerful side strain on the root with every heave of the tide; hence also the thin delicate frond of the present species is less apt to be torn or split up into narrow laciniæ.

LAMINARIA LONGICRURIS.

EXPLANATION OF DISSECTION.

Fig. 1.—Portion of the hollow stem of frond.
(Reduced from *Phyc. Brit.*)

Plate CXLIX.

LAMINARIA SACCHARINA.—*Lamour.*

Gen. Char.—Frond stalked, coriaceous or rarely membranaceous, flat, without a midrib. Fructification: spores collected in spots or sori under the surface of some part of the frond. Name from *lamina*, "a thin plate."

Laminaria *saccharina*.—Root consisting of many strong, branching fibres; stem cylindrical, smooth, suddenly expanding at the apex into an elongate, lanceolate, acuminate, submembranaceous, entire, much crisped frond.

Laminaria *saccharina*.—*Lamour. Ess.* p. 22; *Lyngb. Hyd. Dan.* p. 21, t. 5; *Ag. Sp. Alg.* vol. i. p. 117; *Ag. Syst.* p. 272; *Hook. Fl. Scot.* part 2, p. 98; *Grev. Fl. Edin.* p. 282; *Grev. Alg. Brit.* p. 32; *Hook. Br. Fl.* vol. ii. p. 272; *Wyatt, Alg. Danm.* No. 54; *Endl.* 3rd Suppl. p. 27; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 132; *Kütz. Phyc. Gen.* t. 24, f. 1; *Kütz. Sp. Alg.* p. 574; *Harv.* in *Mack. Fl. Hib.* part 3, p. 171; *Harv. P. B.* plate 289; *Harv. Man.* p. 30; *Harv. Syn.* p. 27; *Atlas*, plate 7, fig. 28; *Harv. N. B. A.* part 1, p. 92.

Laminaria *latifolia*.—*Ag. Sp. Alg.* vol. i. p. 119; *Ag. Syst.* p. 272; *Grev. Alg. Brit.* p. 34; *Post. & Rupp.* p. 10; *Kütz. Syst. Alg.* p. 575.

Fucus *saccharinus*.—*Linn. Sp. Pl.* p. 1630; *Fl. Lapp.* p. 364; *Gmel. Hist. Fuc.* p. 194, t. 27 and 28; *Huds. Fl. Angl.* p. 578; *Lightf. Fl. Scot.* vol. ii. p. 940; *Good. & Woodw.* in *Linn. Trans.* vol. iii. p. 151; *Turn. Syn.* vol. ii. p. 198; *Turn. Hist.* t. 163; *Esper, Ic. Fuc.* vol. i. t. 24, 56 and 57; *Stack. Ner. Brit.* t. 9; *E. Bot.* t. 1376; *Fl. Dan.* t. 416.

Hab.—On rocks and stones from low-water mark to twelve fathoms. Perennial. Very common.

Geogr. Dist.—Northern Ocean, extending round the world; Atlantic shores of Europe, as far as the south of France; and of North America as far as New Jersey.

Description.—Root, a conical mass of stout, branching fibres. Stem rather thickest at the base, slightly tapering upwards, cylindrical and smooth, eight inches to a foot or more in length, and from a quarter to half an inch in diameter, flattened at the apex, and suddenly expanding into the frond, which is widest at the base, gradually tapering to the summit, where it is somewhat acute when entire, but is generally more or less erose, especially in old plants, by the forcible detachment of the old frond; the margin in young plants nearly plane, but in old ones always more or less crisped and waved, very variable in length and

breadth, sometimes nearly linear, at others roundish ovate, five to six feet or more in length, and from two to six inches or more in breadth, slightly thickened in the middle, especially in old specimens, in the manner of an obscure midrib, sometimes smooth, more frequently marked by large transverse or longitudinal wrinkles. Substance submembranaceous or coriaceous, more or less adhering to paper. Colour of the young plant pale brownish or greenish brown, when old dark olive brown, or when very old nearly black or blackish olive. "Fructification, according to Turner, occupying irregularly shaped spots in the centre of the leaf, from half an inch to an inch in width, and of various lengths, sometimes extending uninterruptedly throughout the frond, at other times broken without order."—*Phyc. Brit.*

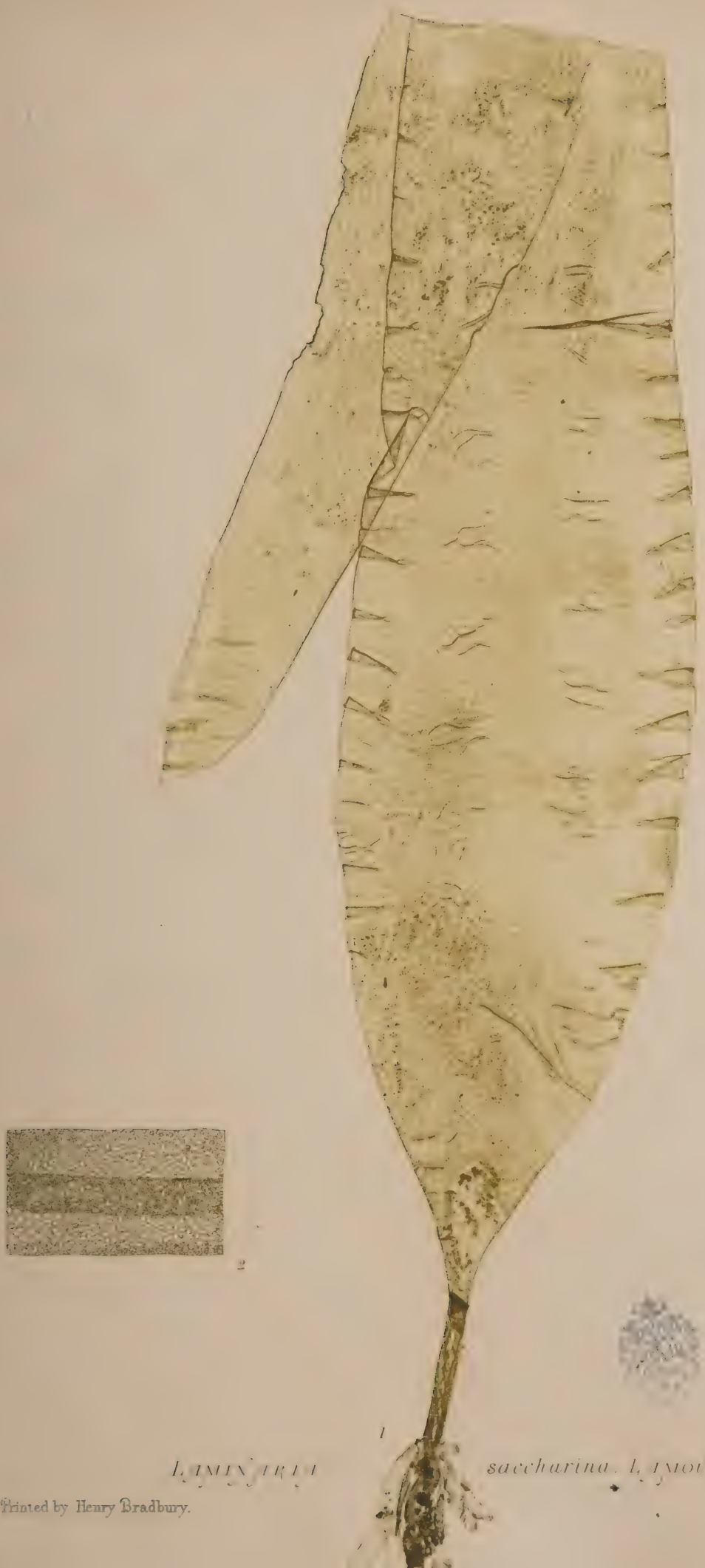
A very common species in every tide-pool and sheltered bay on all our shores, never growing, however, where there is any risk of its being left by the tide, but exhibiting its greatest luxuriance perhaps at a depth of one or two fathoms.

Specimens differ widely in comparative length and breadth, according to the age of the plant as well as the age of the frond; we have frequently seen specimens from two to three feet in length, and scarcely more than an inch in breadth, while a specimen is just now before us not much over two feet in length, but measuring nine inches in breadth a little above the base. Generally too, the base is broad and rounded, but occasionally also we have seen it more or less cuneate or tapering. It is no uncommon thing to meet with fronds from three to five inches in breadth, and from six to eight or even ten feet in length.

It does not generally grow in the middle of the rock-pool, except when it is occupied by large stones, but often forms a dense fringe round its margin, extending not unfrequently to the middle of the pool.

EXPLANATION OF PLATE CXLIX.

Fig. 1.—*Laminaria saccharina*, young frond, natural size.
2.—Section of same. Magnified.



Laminaria saccharina. Lamour.

Printed by Henry Bradbury.

Plate CL.

LAMINARIA PHYLLITIS.—*Lamour.*

Gen. Char.—Frond stalked, coriaceous or rarely membranaceous, flat, without a midrib. Fructification: spores collected in spots or sori under the surface of some part of the frond. Name from *lamina*, "a thin plate."

Laminaria *phyllitis*.—Frond small, delicately membranous, simple, arising from a short "subcompressed" stem, lanceolate, with a narrow tapering base, and crisped margin.

Laminaria *phyllitis*.—*Lamour. Ess.* p. 22; *Lyngb. Hyd. Dan.* p. 23; *Ag. Sp. Alg.* vol. i. p. 121; *Ag. Syst.* p. 273; *Spreng. Syst. Veg.* vol. iv. p. 325; *Grev. Alg. Brit.* p. 34; *Hook. Br. Fl.* vol. ii. p. 272; *Endl.* 3rd Suppl. p. 27; *Kütz. Phyc. Gen.* p. 345; *Harv.* in *Mack. Fl. Hib.* part 3, p. 171; *Harv. P. B.* plate 192; *Harv. Man.* p. 31; *Harv. Syn.* p. 28; *Atlas*, plate 8, fig. 29; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 131.

Laminaria *saccharina* (young state).—*Hook. Fl. Scot.* part 2, p. 98.

Laminaria *saccharina*, var. *attenuata*.—*Grev. Fl. Edin.* p. 282.

Fucus *phyllitis*.—*Stack. Ner. Brit.* t. 9; *Turn. Syn.* p. 193; *Turn. Hist.* t. 164; *E. Bot.* t. 1331; *Esper, Ic.* t. 149.

Fucus *phyllitidis folio*.—*Raii Syn.* p. 40.

Hab.—On rocks and stones in tide-pools, as well as in four to six fathoms water. Perennial. Summer. Not uncommon.

Geogr. Dist.—Atlantic shores of Europe.

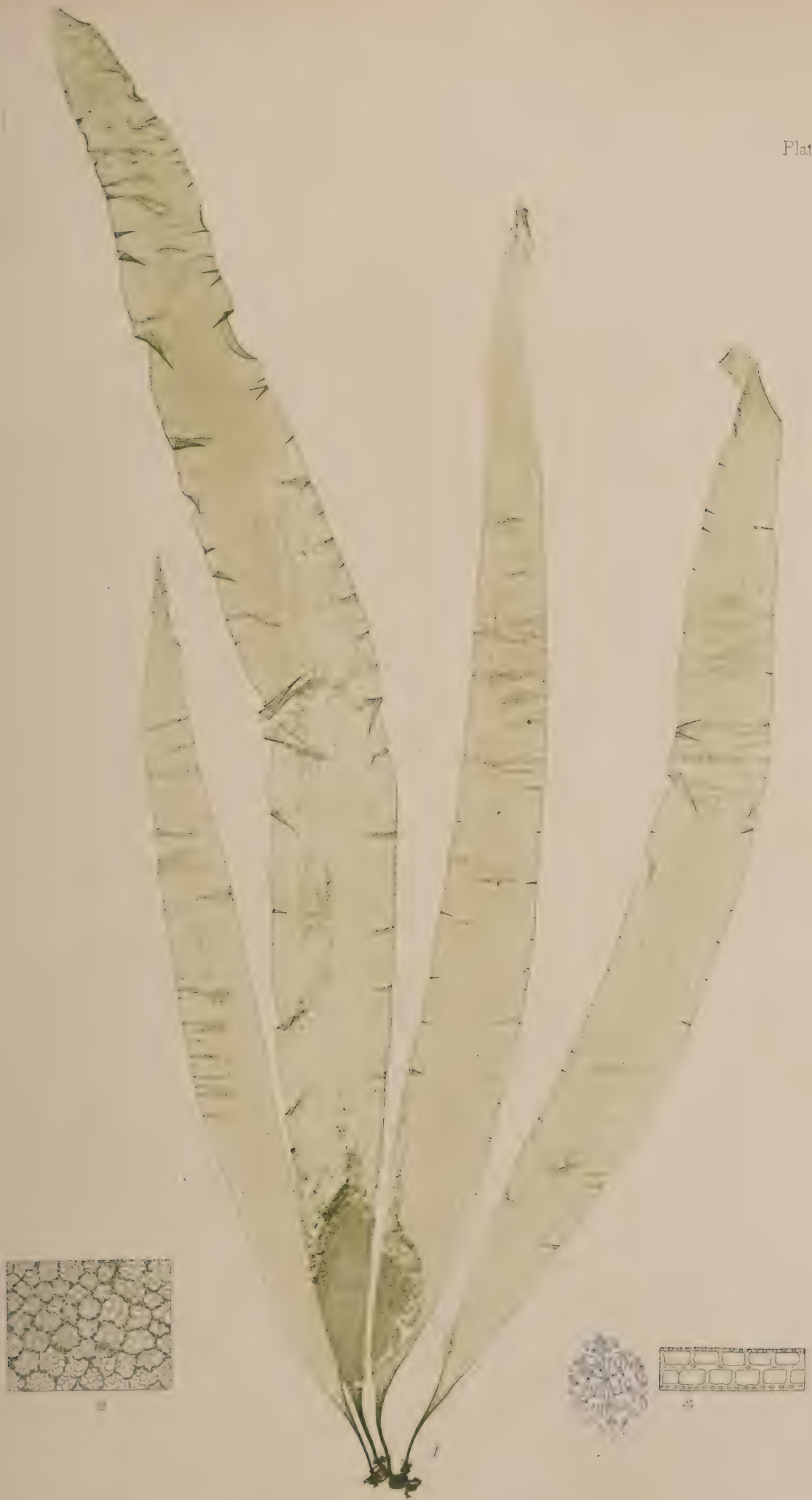
Description.—Root composed of a few sparingly-branched slender fibres. Stem short, from half an inch to an inch in length, and from one-fourth to half a line in thickness, gradually widening into the frond, which is slightly widened to the middle, then tapering to the apex, which is rather acute when entire, but like all the other species of the genus, generally more or less eroded and obtuse; mostly smooth and plane in the middle, always more or less crisped on the edges, from six to ten inches or more in length, and from half an inch to an inch in breadth. Structure consisting of "a double stratum of large air-cells, whose walls, as well as the surfaces of the frond, are composed of minute cellules." Substance delicately membranous, but firm, and not very perfectly adhering to paper; generally least so in the upper part of the frond. Colour, a fine delicate olive green when young; when older, more brownish yellow; generally tinged with brownish red at the base. The fructification we have not seen, and believe it to be unknown.

This very pretty and delicate species seems to be by no means rare; at least, if we understand it properly, it is a common form on the east coast of Scotland. All the specimens, however, that we have received from correspondents are, we fear, referable to the young state of *L. saccharina*. It is a very sociable species, growing always in dense masses wherever we have found it, and usually near low-water mark; frequently on large stones in tide-pools, which it entirely covers, and in narrow ruts between rocks where a strong stream runs, which it often fills up, swinging backwards and forwards with each returning wave.

As to its claims to specific distinction, we must acknowledge, that although we have studied its development for several years, we still feel, and even more than ever feel, unwilling to give a decided opinion. Indeed, the more attention we have paid to the subject, the more satisfied we are that there are two species; but at the same time, the less do we feel disposed to hazard an opinion, from a conviction that the species are either very closely allied, or that their characters are still but imperfectly understood.

EXPLANATION OF PLATE CL.

Fig. 1.—*Laminaria phyllitis*, natural size.
2.—Surface of frond.
3.—Section of same. Both magnified.



LAMINARIA Phyllitis. LAMOUR.

Nature Printed by Henry Bradbury.

Plate CLI.

LAMINARIA FASCIA.—*Ag.*

Gen. Char.—Frond stalked, coriaceous or rarely membranaceous, flat, without a midrib. Fructification: spores collected in spots or sori under the surface of some part of the frond. Name from *lamina*, "a thin plate."

Laminaria *fascia.*—Frond with a very short scarcely distinct stem, gradually expanding into a thin, membranous, linear-lanceolate, obovate-lanceolate or oblong frond, generally obtuse at the extremity.

Laminaria *fascia.—Ag. Syn.* p. 19; *Ag. Sp. Alg.* vol. i. p. 122; *Syst.* p. 273; *Wyatt, Alg. Damn.* No. 157; *E. Bot.* Suppl. t. 2845; *Hook. fil. Fl. Ant. ined.*; *Endl.* 3rd Suppl. p. 27; *Harv. P. B.* plate 45; *Harv. Man.* p. 31; *Harv. Syn.* p. 28; *Atlas*, plate 8, fig. 30.

Laminaria *debilis.—Ag. Spec.* vol. i. p. 120; *Syst.* p. 273; *Grev. Crypt.* t. 277; *Grev. Alg. Brit.* p. 35, t. 5; *Hook. Br. Fl.* vol. ii. p. 272; *Harv. Man.* 1st ed. p. 25; *Endl.* 3rd Suppl. p. 27.

Laminaria *cuneata.—Suhr.*

Laminaria *cæspitosa.—J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 130.

Laminaria *papyrina.—Bory*, in *Dict. Class. d'Hist. Nat.* vol. ix. p. 189.

Fucus *fascia.—Fl. Dan.* t. 768; *Turn. Syn.* vol. i. p. 186; *Roth, Cat. Bot.* vol. ii. p. 161.

Hab.—On submarine rocks and stones in the sea, near low-water mark. Annual. Summer. Not uncommon.

Geogr. Dist.—Atlantic shores of Europe from Norway to Spain; Mediterranean Sea (*Agardh*); Falkland Islands (*Lyall*).

Description.—Root, a minute disc. Stem, scarcely any, cylindrical at the base, but immediately becoming flattened, and gradually expanding into a thin but tough linear-lanceolate, obovate or obovate-lanceolate frond, four to twelve inches in length, and from a line to an inch and a-half in breadth, sometimes very obtuse at the apex, and at other times more acute; the margins more or less waved, and not unfrequently slightly sinuated, as if small fragments had been cut out; the surface quite smooth, and generally with a bright gloss, often with a golden hue in some specimens, while in others the surface is almost entirely without gloss. Structure consisting of rather large oblong cells; those of the surface minute. Substance membranaceous, rather firm, and very imperfectly adhering to paper. Fructification appears to be unknown. Colour, at first greenish olive, gradually becoming more yellow as it advances in age, and when full grown, is of a rich golden green with a fine gloss.

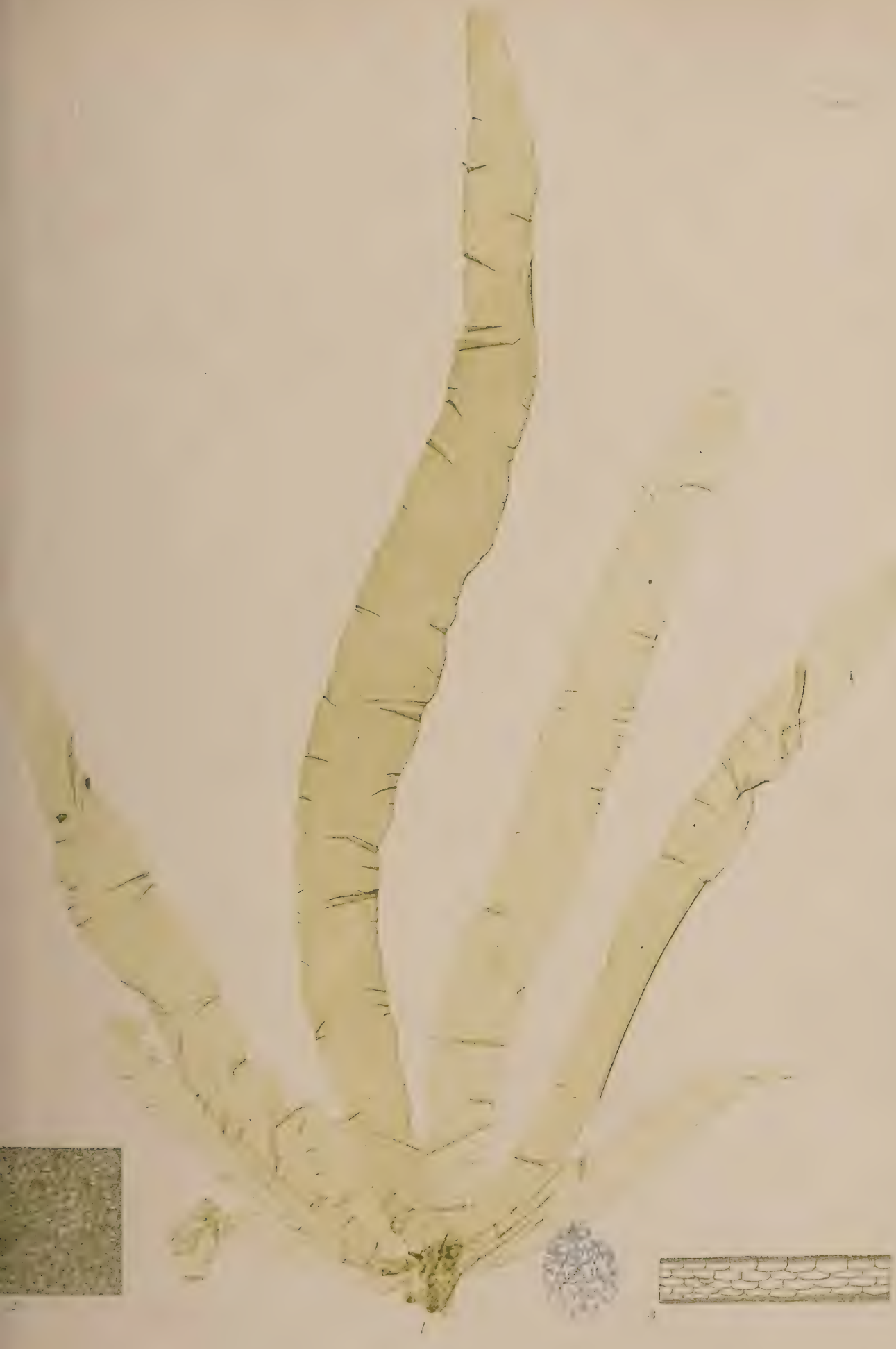
The present is by no means a rare species on the east coast of Scotland, growing on smooth stones in rock-pools, as well as on rocks near low-water mark. When well grown, and in a good state of preservation, it is a beautiful species, and abundantly distinct and easily known from the preceding as from every other British species of *Laminaria*. There is another plant, however, with which it is often confounded, and under whose name we have often received the present species, namely, *Punctaria plantaginea*. From this there cannot be the least difficulty in distinguishing it, when the structure is taken into account, as, when placed under the microscope, the large quadrate cells of *Punctaria* may be at once known from the minute cellules on the surface of the *Laminaria*. In old plants too, the fructification and brown colour of *Punctaria* render it easily recognizable; but in young specimens these characters are not apparent, young narrow varieties of the *Punctaria* being almost identical in colour and form with narrow forms of *Laminaria fascia*.

There is perhaps no species of *Laminaria* more variable in form than the present. We have specimens now before us several inches in length, and scarcely broader than a hair, while in the same patch there are specimens not more than twice the length, but three-quarters of an inch in breadth; the apex is generally more or less rounded, but frequently retuse or truncate, sometimes obliquely; the margins all round more or less waved. Sometimes the form is almost linear, sometimes elongate-obcuneate, widening gradually from the base to the apex, and then abruptly truncate. At other times it gradually widens to the middle and then tapers; sometimes to a rather acute, at other times to a truncate or rounded point. At other times the one side is contracted so that the frond assumes a curved form, whilst in others the frond seems as if it had been nearly cut across, and the wounds all properly healed, the margins being all smooth and even.

We have met with the plant at all seasons; but our finest specimens were collected in May, and we are rather inclined to think the plant is a spring species. On one occasion we met with it in considerable abundance, covering a smooth stone in a tide-pool near low-water mark. Visiting the same locality in the autumn of the same year, and in the hope of procuring larger and full-grown specimens, we again examined the same stone, but were rather disagreeably disappointed on finding the stone covered with a rich crop of *Rhodymenia palmata*, and not a single frond of our little favourite could be found.

EXPLANATION OF PLATE CLI.

Fig. 1.—*Laminaria fascia*, natural size.
2.—Surface of frond.
3.—Section of same. Both magnified.



Laminaria fascia. Sld.

Printed by Henry Bradbury

Plate CLII.

CHORDA FILUM.—*Lamour.*

Gen. Char.—Frond cartilaginous, simple, filiform, cylindrical, tubular, the tube divided at regular intervals by transverse septa. Fructification : obconical spores, forming a dense stratum over the whole external surface of the frond, and "mixed with elliptical antheridia (?)" Name from *chorda*, "a chord."

Chorda *filum.*—Frond much elongated, attenuated to each end, very lubricous, and everywhere covered with scattered confervoid hairs ; no external constrictions at the septa.

Chorda *filum.*—*Lamour. Ess.* p. 26 ; *Lyngb. Hyd. Dan.* p. 72, t. 18 ; *Hook.* in *Fl. Lond. N. S.* t. 204 ; *Grev. Alg. Brit.* p. 47, t. 7 ; *Hook. Br. Fl.* vol. ii. p. 276 ; *Wyatt, Alg. Danm.* No. 159 ; *Kütz. Phyc. Gen.* p. 334, t. 29 ; *Harv.* in *Mack. Fl. Hib.* part 3, p. 174 ; *Harv. P. B.* plate 107 ; *Harv. Man.* p. 31 ; *Harv. Syn.* p. 29 ; *Atlas*, plate 8, fig. 31 ; *Harv. N. B. A.* part 1, p. 98.

Chordaria *filum.*—*Ag. Syn.* p. 13 ; *Hook. Fl. Scot.* part 2, p. 98.

Scytosiphon *filum.*—*Ag. Sp. Alg.* vol. i. p. 161 ; *Ag. Syst.* p. 257 ; *Grev. Fl. Edin.* p. 288 ; *Sprcng. Syst. Veg.* vol. iv. p. 328 ; *Endl.* 3rd Suppl. p. 25 ; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 126.

Fucus *filum.*—*Linn. Sp. Pl.* p. 1631 ; *Stack. Ner. Brit.* t. 10 ; *Turn. Hist.* t. 86 ; *E. Bot.* t. 2487.

Fucus *tendo.*—*Esper*, t. 22.

Ceramium *filum.*—*Roth, Cat. Bot.* vol. i. p. 147.

Var. *β. tomentosa.*—Small size, densely covered with olive-green hairs.

Harv. P. B. plate 107 ; *Harv. Man.* p. 31.

Chorda *tomentosa.*—*Lyngb. Hyd. Dan.* p. 74, t. 19.

Hab.—On rocks, stones, and old shells from just within tide-mark, to the depth of twenty fathoms. Annual. Summer and autumn. Very common.

Geogr. Dist.—North Atlantic and North Pacific, abundant ; coast of Brazil.

Description.—Root, a very minute disc. Frond three to six or even "forty" feet in length, and from one to three lines or more in diameter in the middle, very much attenuated to the base, and gradually tapering to a rather acute point, everywhere covered, when young, with scattered, pellucid, gelatinous hairs, from one to three-quarters of an inch in length ; when old these mostly disappear, the fronds becoming more

harsh and less lubricous, cylindrical, and traversed by an internal tube occupying about two-thirds of the diameter, and divided at a distance of about two diameters by membranous diaphragms, not indicated by any external constriction or swelling. Structure consisting of two strata of cells; the inner large, oblong, and cylindrical, the outer minute, gradually smaller to the surface, where they are moniliform, all more or less arranged in longitudinal filiform series. Substance cartilaginous, rather flaccid when young, and closely adherent to paper, by means of its covering of lubricous hair-like filaments; less so when old, and these have become abraded. Colour, a dark olive-green, almost black when dry. Fructification: minute obconical spores, attached by a long pedicel to the surface of the frond, and enclosed in a wide pellucid limbus, forming a dense stratum on the outer surface of the frond, and "mixed with numerous narrow, elliptical, transversely striate bodies, which may be antheridia."

This curious plant is said to be abundant throughout all the north temperate zone, both in the Atlantic and Pacific, and even to be found in Brazil (*Phyc. Brit.*), so that it and allied species are perhaps equally abundant in the southern hemisphere.

It is found in more or less abundance on all the British shores, but in particular in quiet bays and deep pools at and beyond low-water mark, varying in length according to the depth at high-water, beyond which it never grows, whilst at low-water it may be often seen spreading on the surface for a distance of several feet, the lower part standing erect in dense patches, or bending gracefully in the swell, thus forming a singularly curious and beautiful submarine grove, through which the fingered and finny tribes gambol in fancied security.

In autumn the tufts often become more or less matted and twisted together, forming rope-like masses, often of great length and thickness, and then become torn from their base, and are thrown on the beach in large masses. It is an autumn plant, and seldom makes its appearance till the summer has considerably advanced.

The variety β *tomentosa* is a very beautiful one, and may be occasionally met with in the same pool with the normal form, but is much less common.

Sir W. Hooker mentions another variety (*Brit. Fl.* vol. ii. p. 276), β *thrix*, with "frond very slender, almost capillary, two to four inches in length;" this we have not seen.

The "elliptical bodies" noticed above are plentifully scattered among the obconical spores, and are described by Professor Harvey as "*antheridia*," and by Captain Carmichael as a different kind of spores.

EXPLANATION OF PLATE CLII.

Fig. 1.—*Chorda filum*, natural size.
2.—Longitudinal section of frond.
3.—Transverse section of same.
4.—Portion of the frond unrolled.
5.—Spores.
6.—Antheridia.
7.—Internal chambers. All magnified.
(Partly reduced from *Phyc. Brit.*)

CHORDA filum, LAMOUR.

Nature Printed by Henry Bradbury.

Plate CLIII.

CHORDA LOMENTARIA.—*Lyngb.*

Gen. Char.—Frond cartilaginous, simple, filiform, cylindrical, tubular; the tube divided at regular intervals by transverse septa. Fructification: obconical spores, forming a dense stratum over the whole external surface of the frond, and "mixed with elliptical antheridia (?)" Name from *chorda*, "a chord."

Chorda *lomentaria* (?).—Frond membranaceous; septa distant, at very irregular intervals, and marked by external constrictions, intervals somewhat inflated.

Chorda *lomentaria.—Lyngb. Hyd. Dan.* p. 74, t. 18; *Grev. Alg. Brit.* p. 48 *Hook. Brit. Fl.* vol. ii. p. 276; *Wyatt, Alg. Danm.* No. 6; *E. Bot.* Suppl. t. 2902; *J. Ag. Alg. Medit.* p. 45; *Harv.* in *Mack. Fl. Hib.* part 3, p. 174; *Harv. P. B.* plate 285; *Harv. Man.* p. 32; *Harv. Syn.* p. 30; *Atlas*, plate 8, fig. 32; *Harv. N. B. A.* part 1, p. 98.

Chorda *fistulosa.—Zanard. Syn. Alg. Adr.* p. 87.

Scytosiphon *lomentarium.—Endl.* 3rd Suppl. p. 25; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 126.

Scytosiphon *filum*, var. γ.—*Ag. Spec. Alg.* vol. i. p. 162; *Ag. Syst.* p. 257.

Solenia *fuscata.—Bory, Morée*, No. 1485.

Asperococcus *castaneus.—Carm. Hook. Br. Fl.* vol. ii. p. 277.

Chlorosiphon *Shuttleworthianus.—Kütz. Phyc. Gen.* p. 301.

Hab.—On rocks, stones, &c., in tide-pools. Annual. Summer and autumn. Very common.

Geogr. Dist.—Atlantic shores of Europe; Mediterranean Sea; North and South America; Japan; Southern and Antarctic Oceans.

Description.—Root, a minute disc. Fronds much tufted, from six to ten inches or more in length, and from one to three lines in diameter in the middle, much attenuated at the base, and tapering at the summit to an obtuse point, much constricted at very unequal distances, surface smooth but not lubricous, tubular upwards, solid at the base, very slender and cylindrical, the intervals between the constrictions somewhat inflated, in the young state cylindrical throughout, and without constrictions, the structure consisting entirely of small cells, gradually becoming more minute towards the circumference, roundish hexagonal. In old plants the surface becomes coated over with a stratum of densely packed moniliform radiating filaments, which may in some way or other

be connected with the fructification; but we have seen nothing analogous to fructification either imbedded among them or formed in the articulations.

The affinities of this species are very doubtful. They are not very closely connected with the preceding, nor with any other with which we are acquainted; and until the fructification is better understood, there is perhaps no hope of a more satisfactory understanding of the species.

Dr. Greville has described the fructification as interrupted masses of cylindrical or somewhat clavate filaments united in pairs by their bases, whereas the stratum of moniliform filaments, above noticed, appears to be ultimately continuous, and the filaments not otherwise united than by the surface stratum of cells to which they are attached.

In the young state the plant differs very little either in structure or habit from *Asperococcus echinatus*, with which Captain Carmichael has united it; and even when old and covered with the radiating filaments, the difference is perhaps only one of degree; the stratum of filaments differing, perhaps, rather in their more general diffusion over the surface of the frond than in their essential character.

The plant is an intratidal species, preferring clear, rocky, rather shallow pools, not much infested with other Algæ.

EXPLANATION OF PLATE CLIII.

Fig. 1.—*Chorda lomentaria*, natural size.
2.—Transverse section of frond.
3.—Longitudinal section of frond at the contraction.
4.—Section near the base.
5.—Entire cross section.
6.—Filaments of periphery. All magnified.

Chorda Lomentaria, Lyngb.

Printed by Henry Bradbury.

Plate CLIV.

CUTLERIA MULTIFIDA.—*Grev.*

Gen. Char.—Root a flat disc, coated with woolly filaments; frond cellular, cartilagineo-membranaceous, plano-compressed, irregularly dichotomous, without midrib. Fructification: "Dot-like tufts of pedicellate utricles, scattered over both surfaces of the frond, each utricle containing several spores."—*Phyc. Brit.* "Antheridia on distinct plants, linear, transversely dotted, sessile on the sides of minute tufted filaments, occupying the position of true sori."—*Phyc. Brit.*

Cutleria *multifida.*—Frond plane but rather thickish, flabelliform, irregularly dichotomous, repeatedly cleft upwards into numerous narrow laciniæ, erect, with very acute axils.

Cutleria *multifida.*—*Grev. Alg. Brit.* p. 60, t. 10; *Hook. Br. Fl.* vol. ii. p. 281; *Wyatt, Alg. Danm.* No. 61; *J. Ag. Alg. Medit.* p. 40; *Menegh. Alg. Ital. et Dalm.* p. 201; *Endl.* 3rd Suppl. p. 25; *Kütz. Phyc. Gen.* p. 339; *Dickie, Ann. Nat. Hist.* vol. xiv. p. 168; *Harv.* in *Mack. Fl. Hib.* part 3, p. 177; *Harv. P. B.* plate 75; *Harv. Man.* p. 36; *Harv. Syn.* p. 30; *Atlas*, plate 9, fig. 33; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 104.

Zonaria *multifida.*—*Ag. Sp.* vol. i. p. 135; *Syst.* p. 267.

Dictyota *penicillata.*—*Lamour.* in *Desv. Journ. Bot.* vol. ii. p. 41; *Lamour. Ess.* p. 58; *Ag. Sp. Alg.* vol. i. p. 139.

Dictyota *multifida.*—*Bory, Morée*, p. 75, No. 1756.

Sporochnus *multifidus.*—*Spreng. Syst. Veg.* vol. iv. p. 329.

Ulva *multifida.*—*Engl. Bot.* t. 1913.

Hab.—On rocks, stones, and shells in four to twenty fathoms water. Annual. Summer and autumn. Rare. Yarmouth (Messrs. *Turner* and *Wigg*); Seaton and Torquay (*Mrs. Griffiths*); Sidmouth (*Miss Cutler*); Brighton (*Mr. Borrer*); Plymouth (*Rev. W. S. Hore*); Bantry Bay (*Miss Hutchins*); Ballycotton (*Miss Ball*); Kilkee and Wicklow (*Dr. Harvey*); Roundstone Bay (*Mr. M'Calla*); Orkney (*Dr. Harvey*); Lamlash Bay, Arran (*Major Martin*).

Geogr. Dist.—Coast of England and Ireland; Atlantic shores of France and Spain; Mediterranean Sea.

Description.—Root, a broad flattened disc, densely clothed with minute confervoid tomentose fibres. Stem very short, immediately expanding into the base of the frond, which is plano-compressed, more or less flabelliform, and dividing in an irregularly dichotomous manner, just above the base, into numerous and repeatedly branched segments, most of the divisions being dichotomous, but, especially upwards, more or less secund, fasicled, or proliferous; the divisions all very erect, with

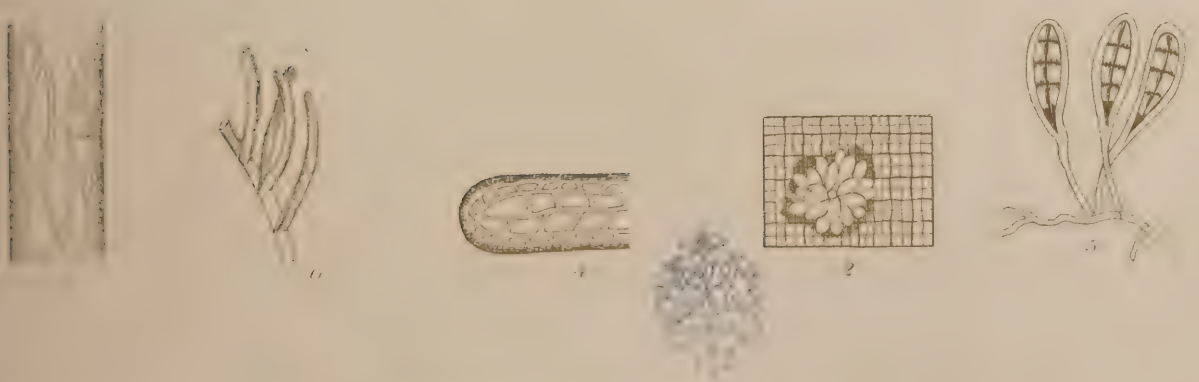
acute axils, the apices laciniato-multifid; "each lacinia terminated when perfect with a pencil of minute confervoid filaments;" "a net-work of similar but branching filaments extends over the whole surface of the frond, closely investing it, and to this network the fructification is attached." —*Phyc. Brit.* Fructification of two kinds on distinct individuals: 1, Pedicellate, oblong utricles, each containing about eight spores, clustered in minute tufts, which are plentifully dispersed over both surfaces of the frond, appearing like dots to the naked eye;" 2, "Sausage-shaped or linear, obtuse antheridia (?) attached to tufted filaments, and scattered like utricles over the whole frond;" "they are densely zoned with dotted lines." — *Phyc. Brit.* Structure loosely cellular, central cells very large, oblong polygonal, smaller towards the circumference. Substance cartilaginous, "at first crisp, but becoming flaccid," and more or less adhering to paper. Colour, a dull yellowish olive.

This fine species is not unfrequently cast on shore on the southern shores of the kingdom, and occasionally dredged on a hard gravelly or shelly bottom in deep water. When obtained in a perfect state, the narrow apices of the ultimate segments are beautifully fringed with slender confervoid filaments, which are generally abraded in old plants, and in specimens picked up on the beach. Its favourite habitat is on old shells, often associated with zoophytes, to some of the flat species of which, such as the *Flustræ*, it bears considerable resemblance.

The name is commemorative of Miss Cutler, of Sidmouth, to whom the botany of her own neighbourhood, as well as that of Britain in general, is under many obligations.

EXPLANATION OF PLATE CLIV.

Fig. 1.—*Cutleria multifida*, natural size.
2.—Sorus.
3.—Longitudinal section of stem.
4.—Transverse section of same.
5.—Utricles from sorus.
6.—Antheridia. All magnified.
(Reduced from *Phyc. Brit.*)



Cutleria multifida. Grev.

Henry Bradbury

Plate CLV.

HALISERIS POLYPODIOIDES.—*Ag.*

Gen. Char.—Frond membranaceous, linear, flat, with a midrib; root a dense mass of woolly fibres. Fructification: roundish or ovate spores collected into oblong sori, and mostly arranged in longitudinal lines. Name from ἅλς, "the sea," and σέρις, "endive."

Haliseris *polypodioides.*—Frond from a narrow base, linear oblong, dichotomous, apices rounded, forked sori oblong, arranged in longitudinal series on each side of the midrib.

Haliseris *polypodioides.—Ag. Sp. Alg.* vol. i. p. 142; *Syst.* p. 262; *Spreng. Syst. Veg.* vol. iv. p. 328; *Grev. Alg. Brit.* p. 64, t. 8; *Hook. Br. Fl.* vol. ii. p. 283; *Mack. Fl. Hib.* part 3, p. 178; *Wyatt, Alg. Danm.* No. 12; *Kütz. Phyc. Gen.* p. 340, t. 23; *Mont. Pl. Cell. Canar.* p. 148; *Harv. P. B.* plate 19; *Harv. Man.* p. 36; *Harv. Syn.* p. 30; *Atlas*, plate 9, fig. 34; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 117.

Dictyopteris *polypodioides.—Lam. Jour. Bot.* p. 19, sec. *Ag.*

Dictyopteris *elongata.—Lam.* l. c. p. 18, sec. *Ag.*

Fucus *polypodioides.—Desf. Fl. Atl.* vol. ii. p. 421; *Lam. Dict.* p. 32, t. 24, f. 1.

Fucus *membranaceus.—Stack. Ner. Brit.* p. 13, t. 6; *Turn. Syn. Fuc.* vol. i. p. 141; *With. Br. Pl.* vol. iv. p. 93; *E. Bot.* t. 1758; *Turn. Hist.* t. 87.

Fucus *ambiguus.—Clem. Ess.* p. 310.

Ulva *polypodioides.—Dec. Fl. Fran.* vol. xi. p. 15.

Hab.—On rocks and stones in the sea, from two to six fathoms. Perennial. Summer and autumn. Several places along the southern shores of England, not uncommon. Shields (*Mr. Winch*); Miltown Malbay (*Dr. Harvey*); Youghal (*Miss Ball*); Roundstone (*Mr. M'Calla*); Jersey (*Misses White* and *Turner*).

Geogr. Dist.—Atlantic and Mediterranean shores of Europe. North of Africa (*Desf.*); Ceylon (*Herb. Linn.*); South Africa (*Ecklon*); Bahia (*Martius*); Canary Islands (*Despreaux*).

Description.—Root, a flattened disc, densely covered over with slender matted fibres. Fronds much tufted, six to ten inches in length, and from a quarter to half an inch wide upwards, narrow, and nearly cylindrical at the base, widening for an inch or more, then oblong, flat, with a stout midrib extending to the apex, which is rounded and obtuse; the margins at first entire, but at length split down obliquely to the midrib into numerous broad laciniæ, especially in the older parts; branches dichotomous, sometimes secund, with, not unfrequently,

smaller proliferous branches arising here and there among the rest, all the lower branches erect, upper erecto-patent; axils, lower acute, upper more wide and rounded. Structure cellular, cells oblong, those composing the midrib arranged in longitudinal linear series, those of the margins in linear oblique series, pointing upwards. Fructification: roundish ovate spores, mostly collected in oblong sori, which are arranged in longitudinally linear series along each side of the midrib, with sometimes "scattered single spores (?) of larger size than the former, dispersed over the frond." Substance membranaceous, rather firm, and scarcely adhering to the paper in drying. Colour, a brownish olive-green. Said, when fresh, to exhale a very disagreeable odour.

This curious plant differs widely in its structure from every other British species, and seems to have found its northern limit on our southern shores. In the more southern parts of Europe, it is said to be abundant, and has been found widely distributed in the tropics. We have seen specimens with small dark-coloured dots scattered over the surface, but could not detect anything like spores in them, and are unacquainted with the "scattered capsules" mentioned by most authors. The margins of the frond are normally entire, but eventually become torn by the action of the waves, in the same manner as those of *Alaria* and some other Algæ. Professor Harvey also observes (*Phyc. Brit.*) that Mrs. Griffiths has found fronds with the place of the fructification occupied by transparent spaces bounded by pale lines, which he supposes may indicate a diseased state of the fruit-bearing cells.

EXPLANATION OF PLATE CLV.

Fig. 1.—*Haliseris polypodioides*, natural size.
2.—Surface cells with sorus.
3.—The same with single spores?
4.—Spores from a sorus. All magnified.

Halliseris polypodioides. Ag.

Nature Printed by Henry Bradbury.

Plate CLVI.

PADINA PAVONIA.—*Lamour.*

Gen. Char.—Frond cellular, coriaceous, flat, flabelliform, more or less cleft into numerous broad rounded lobes, marked with darker concentric lines, and involute at the apex. Fructification: utricles or tetraspores, grouped in linear concentric sori, and bursting through the epidermis of the frond; they are obovate, and, when mature, divide in a cruciate manner into four sporules. Name of unknown origin.

Padina *Pavonia.*—Frond thin, broadly flabelliform, more or less deeply cleft into numerous broad obcuneate lobes, with rounded apices, its surface covered with a whitish powder, and marked by many concentric dark lines.

Padina *Pavonia.—Lamour. Dict. Class. d'Hist. Nat.* vol. xii. p. 589; *Gaill. Dict. Hist. Nat.* vol. liii. p. 371; *Grev. Alg. Brit.* p. 62, t. 10; *Hook. Br. Fl.* vol. ii. p. 281; *Wyatt, Alg. Danm.* No. 11; *J. Ag. Alg. Medit.* p. 39; *Endl.* 3rd Suppl. p. 25; *Menegh. Alg. Ital. et Dalm.* p. 239; *Montg. Hist. Cuba,* p. 67; *Cell. Canar.* p. 145; *Alger.* p. 33; *Harv. P. B.* plate 91; *Harv. Man.* p. 37; *Harv. Syn.* p. 31; *Atlas,* plate 9, fig. 35; *Harv. N. B. A.* part 1, p. 104; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 113.

Padina *Mediterranea.—Bory, Morée,* p. 75; *Montag. Crypt. Alg.* No. 79.

Dictyota *Pavonia.—Lamour. Ess.* p. 57.

Zonaria *Pavonia.—Ag. Sp. Alg.* vol. i. p. 125; *Ag. Syst.* p. 263; *Spreng. Syst. Veg.* vol. iv. p. 326; *Kütz. Phyc. Gen.* p. 341, t. 22, f. 1.

Ulva *Pavonia.—Linn. Syst. Nat.* p. 719; *Esper, App.* t. 4; *E. Bot.* t. 1276; *Desf. Fl. Atlant.* vol. ii. p. 428; *Roth, Cat.* vol. ii. p. 240; vol. iii. p. 322.

Ulva *cucullata.—Cav. Ic.* vol. ii. p. 73, t. 191, f. 2 E.

Fucus *Pavonius.—Linn. Sp. Pl.* vol. ii. p. 1630; *Wulf. Crypt. Ag.* p. 33.

Hab.—On rocks and stones in tide-pools about half-tide level. Annual. Summer and autumn. Not rare in many places on the south coasts of England. Jersey.

Geogr. Dist.—Atlantic shores of France and Spain; Tropical, Atlantic, and Indian Oceans.

Description.—Root, a conical mass of woolly-like fibres. Fronds much tufted, two to three inches in length, and the same in breadth, with a narrow, flat, wedge-shaped base, suddenly expanding at about an inch or an inch and a-half from the base into a broad reniform or flabelliform frond, more or less cleft into numerous broad, rounded, obcuneate

segments, their apices involute, and fringed with slender confervoid ciliæ ; the frond with its divisions are all rolled inwards longitudinally, the inner side marked with numerous concentric bands, which are furnished with a ciliated fringe like the outer edge when young, but which is more or less abraded in age ; the upper surface smooth, often polished and shining, more or less marked with minute concentric and radiating striæ and ridges ; outer side rougher, and somewhat fibrous, more or less covered with white powder, striæ and ridges rather more distinctly marked than on the inner side. Structure consisting of a single stratum of minute, oblong, quadrate cells, arranged in longitudinal linear series. Substance coriacco-membranaceous, imperfectly adhering to paper. Colour, a reddish brown at the base, of a fine greenish yellow or shining golden green upwards. Fructification : obovate utricles or tetraspores, surrounded by a broad pellucid limbo, at length divided cruciately into four sporules, and collected in sori under the surface of the concentric bands, which at length bursting allows the spores to escape.

This beautiful plant appears to be not uncommon in many places along the southern shores of England, where alone it is found in this country, increasing in plenty as we proceed southwards ; in Southern Europe it is rather plentiful, and within the tropics is extremely abundant.

The edges of the frond are naturally curved inwards, and when flattened on paper the frond often splits longitudinally in various places, and this seems often to take place even in the growing state ; hence, perhaps, that among the numerous fronds now before us, many of them are split from top to bottom into obcuneate segments, rounded at the top, and gradually tapering to the base.

It delights to grow in rather shallow, clear pools between tides, and having the power of decomposing the rays of light, like *Chondrus crispus* and some other species, but in a greater degree, nothing, it is said, can equal the beauty and splendour of this plant when alive in its native element, where it exhibits a play of colours, if less varied, even more brilliant than those of the rainbow. This power of decomposing the light seems chiefly to reside in the ciliary filaments, which by their number and peculiar arrangement add greatly to the beauty of the object. This rich display of colours, however, is not much seen, except along the margin, until the frond is opened up to the light, when the whole surface, more or less, as the ciliæ are perfect, display the most beautiful prismatic colours, as if sprinkled over with the most brilliant gems.

We have not heard of its recent occurrence farther north than the

south of England, although it is stated in Lightfoot's *Flora Scotica* to have been found at Aberdeen. As there is no other plant that could possibly have been mistaken for it, this is probably a mistake arising from wrong information; yet it is not impossible but that a stray specimen might have been carried by the ocean currents so far north, and found a landing in that neighbourhood.

EXPLANATION OF PLATE CLVI.

Fig. 1.—*Padina Pavonia*, natural size.
2.—Apex of frond and fringe.
3.—Section of frond.
4.—Sorus with part of indusium rolled back.
5.—Tetraspores. All magnified.

Padina pavonia. Lamour.

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ZONARIA COLLARIS.—*Ag.*

Gen. Char.—"Root coated with woolly fibres; frond flat, ribless, fan-shaped, entire or variously cleft, marked with concentric lines; the cells of the surface radiating; margin fringed. Fructification: roundish or irregular, scattered sori, bursting through the cuticle of both surfaces of the frond, consisting, at maturity, of numerous *spores* nestling among jointed threads."—*Phyc. Brit.* Name from ζωνη, "a zone."

Zonaria *collaris.* — "Frond procumbent, coriaceous, orbicular or cuneate, and variously lobed, from its upper surface emitting cup-shaped, membranaceous fronds; the under surface rooting and densely stupose." —*Phyc. Brit.*

Zonaria *collaris.*—*Ag. Sp. Alg.* vol. i. p. 127; *Ag. Syst.* p. 264; *J. Ag. Alg. Medit.* p. 38; *Endl.* 3rd Suppl. p. 25; *Kütz. Sp. Alg.* p. 565; *Harv. P. B.* plate 359; *Harv. Syn.* p. 32; *Atlas*, plate 13, fig. 49; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 107.

Padina *collaris.*—*Grev. Syn.* part 44; *Menegh. Ital.* p. 245; *Mont. Alger.* p. 33.

Padina *omphalodes.*—*Mont. Crypt. Alger.* p. 15, No. 168.

Zanardinia *prototypus.*—*Nardo* (fide *Meneg.* &c.).

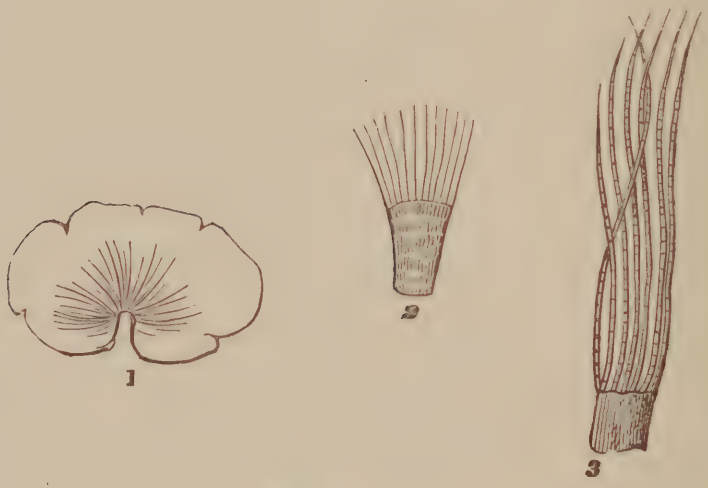
Hab.—Washed ashore at Granville and St. Catherine's Bays, Jersey (May 1851, *Miss Turner; Mr. F. P. Girdlestone*, 1859).

Geogr. Dist.—Mediterranean and Adriatic Seas; West Indian Sea.

Description.—"The primary frond, when mature, is coriaceous in colour and substance, widely spreading, furnished with a dense woolly coating on its lower surface, by which it strongly adheres to rocks; the upper surface is smooth, and variously plaited longitudinally, but by the action of the waves and of animalcules is very much torn and lobed. From the upper surface of this primary frond rise cup-shaped secondary fronds, fixed by a very short stipes, in the dried plant resembling an umbilicus, and with the limb fringed with filaments. The youngest of these secondary fronds are smaller than peas; the full-grown about the height of the cup-shaped fronds of *Himanthalia*; all are delicately membranaceous, entire, and easily torn. The fringe of hairs that crowns the frond is formed of the free apices of the longitudinal strings of cells of the frond. Fruit unknown."—*J. Ag., Phyc. Brit.*

Not being well acquainted with this plant, we give the characters and descriptions from *Phyc. Brit.*

The first specimens found in this country are those which are figured and described in *Phyc. Brit.* from specimens found on the shores of Jersey by Miss Turner, who found the erect or secondary fronds only. They are said to have been quite fresh when picked up, and it is presumed they may have been brought up from the deep water in the Channel. This is now confirmed. For some years back, our zealous friend, Mr. Girdlestone of Jersey, has found each season several specimens of this interesting plant. He writes in answer to our inquiries:—"The *Zonaria* I have found from about the middle of April till the end of June, always floating in the water, of a saucer-like shape, and looking something like the outer skin of a small onion. It is never attached to anything, and I have always found it in St. Catherine's Bay, at very low tide." It is pleasant thus to have securely fixed a good species to our British list. The specimens now before us are very much like those figured in *Phyc. Brit.*



ZONARIA COLLARIS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Zonaria collaris*, natural size.
2.—Margin with fringe.
3.—Same. Both magnified.

ZONARIA PARVULA.—*Grev.*

Gen. Char.—"Root coated with woolly fibres; frond flat, ribless, fan-shaped, entire or variously cleft, marked with concentric lines; the cells of the surface radiating; margin fringed. Fructification: roundish or irregular, scattered sori, bursting through the cuticle of both surfaces of the frond, consisting, at maturity, of numerous *spores* nestling among jointed threads."—*Phyc. Brit.* Name from ζωνη, "a zone."

Zonaria *parvula.* — Fronds procumbent, creeping over the rock to which it is attached by numerous radicles, membranaceous, variously lobed; lobes rounded, their apices free.

Zonaria *parvula.*—*Grev. Crypt. Fl.* t. 360; *J. Ag. Sp. Alg.* vol. i. p. 107; *Harv. P. B.* plate 341; *Harv. Man.* p. 38; *Harv. Syn.* p. 32; *Atlas*, plate 13, fig. 50; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 107.

Padina *parvula.*—*Grev. Alg. Brit.* p. 63; *Hook. Br. Fl.* vol. ii. p. 282; *Harv. Man.* 1st edit. p. 31.

Padina *reptans.*—*Crouan.*

Padinella *parvula.*—*Aresch. Pug.* vol. ii. p. 260, t. 9, f. 1—3.

Aglaiozonia *parvula.*—*Zanard, Sag.* p. 38; *Kütz. Sp. Alg.* p. 566.

Aglaiozonia *reptans.*—*Kütz.* l. c.

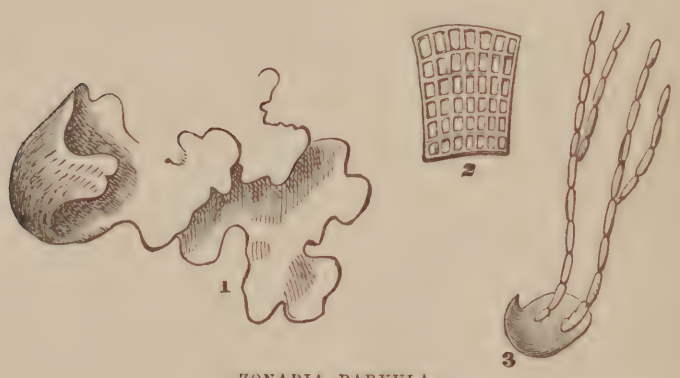
Hab.—On stones, old shells, and Nullipores from near low-water to fifteen or twenty fathoms. Perennial. Summer. Not uncommon. Loch Strangford (*Dr. Dickie*).

Geogr. Dist.—British and French Atlantic coasts; Baltic; Adriatic.

Description.—Fronds procumbent, closely appressed to the rock or other substance on which it grows, in patches of several inches in extent, the segments frequently imbricated, or overlapping in the manner of a foliaceous lichen, the whole under surface adherent by means of its small fibrous radicles, except the apical margins, which are free; the margins are more or less lobed, the lobes rounded, obtuse, retuse, or emarginate, frequently sinuated; the axils, when the lobes become elongate, wide and rounded. Both surfaces are smooth, the under everywhere more or less covered, except at the margin, with slender rootlets, simple or dichotomously branched, and from one to three lines in length. Structure cellular, cells quadrate, arranged in linear longitudinal series, rather longer than broad, the basal ones smallest. Substance membranaceous, firm, scarcely adhering to the paper. Colour, a brownish olive, brown when dry.

The entire habit of the present curious plant is that of one of the foliaceous lichens, and were a person, unacquainted with the plants, to see a specimen of the present Alga placed side by side with some of the paler forms of *Nephroma resupinata* or *Parmelia omphalodes*, he would not, we suspect, very unhesitatingly say that they were not the same, so like are the appearance and mode of growth of the species.

The species is said to prefer calcareous rocks, old shells, and beds of Nullipores, and in such situations is perhaps not unfrequent round the coasts. The fructification seems to be unknown in this country, and has only been found in Sweden by Areschoug, who describes the spores as ected in undefined sori, near the base of the frond.—*Phyc. Brit.*



ZONARIA PARVULA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Zonaria parvula*, natural size.
2.—Surface cells.
3.—Underside of frond and fibres. Both magnified.

Plate CLVII.

TAONIA ATOMARIA.—*Ag.*

Gen. Char.—Frond highly reticulated, flat, subflabelliform, entire, or more or less irregularly cleft or laciniated. Fructification: spores, arranged in transverse bands or sori, somewhat prominent or sub-immersed in both sides of the frond. Name from ταῶν, "a peacock," alluding to the spreading form of the frond, and the zonate bands of fructification.

Taonia *atomaria*.—Frond flat, obcuneate or subflabelliform, more or less cut into linear laciniæ; fructification forming irregularly waved, often interrupted, transverse or concentric lines.

Taonia *atomaria*.—*J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 101; *Harv. Man.* p. 38; *Harv. Syn.* p. 32; *Atlas*, plate 9, fig. 36.

Dictyota *atomaria*.—*Grev. Alg. Brit.* p. 58; *Hook. Br. Fl.* vol. ii. p. 280; *Wyatt, Alg. Danm.* No. 60; *Endl.* 3rd Suppl. p. 24; *J. Ag. Alg. Medit.* p. 37; *Menegh. Alg. Ital.* vol. i. p. 229; *Harv. P. B.* plate 1.

Dictyota *zonata*.—*Lamour. Ess.* p. 57.

Dictyota *ciliata*.—*Lamour. Ess.* p. 58.

Zonaria *atomaria*.—*Ag. Sp. Alg.* vol. i. p. 128; *Ag. Syst.* p. 264; *Grev. Fl. Edin.* p. 298; *Gray, Br. Pl.* vol. i. p. 341.

Padina *atomaria*.—*Montag. Fl. Canar. Pl. Cell.* p. 146.

Padina *phasiana*.—*Bory, Fl. Pelop.* p. 75.

Stypopodium *atomarium*.—*Kütz. Phyc. Gen.* p. 341.

Ulva *atomaria*.—*Woodw.* in *Linn. Trans.* vol. iii. p. 53; *Eng. Bot.* t. 419.

Ulva *serrata*.—*De Cand. Fl. Fran.* vol. ii. p. 11; *Encycl. Bot.* vol. viii. p. 166.

Hab.—On rocks in the sea. Rare. Annual. Summer. At Cromer (*Mr. Wigg*); Carton and Gunton (*Mrs. Fowler*); Warms' Head, Glamorganshire (*Mr. Dillwyn*); Coast of Devon (*Mrs. Griffiths*); Sussex (*Mr. Borrer*); Frith of Forth (*Dr. Greville*); Ballycotton, Cork (*Miss Ball*).

Geogr. Dist.—West Indies (*Lamour.*); Canary Islands (*Despréaux*); Mediterranean Sea (*Agardh*); German Ocean; Atlantic coasts of France and Spain.

Description.—Root, a flattened mass of tangled woolly fibres. Fronds much tufted, four to twelve inches long, and from half an inch to two or three inches wide at the summit, very thin and membranous, somewhat translucent, from a narrow base gradually widening to the apex, the edges generally entire or laciniato-dentate, sometimes slightly sinuated, the apices truncate, sometimes nearly entire, but most frequently more or less torn or laciniated irregularly, sometimes divided for a short

distance or occasionally nearly to the base, the axils rather wide and rounded. Substance membranaceous, rather tender, more or less adhering to paper in drying, imperfectly at the base. Colour, at the base, a dark olive brown, paler upwards, pale olive green at the summit. Fructification forming darker concentric zones over the upper two-thirds of the frond, seldom towards the base, at a distance of from one to six or eight lines, the inspaces more or less matted with irregular, interrupted, scattered patches. Spores roundish elliptical, scattered over the whole upper surface of the frond, often forming irregular undulating concentric bands.

This very pretty species is said to have been once found in the Frith of Forth (*Dr. Greville*), but we are not aware of its recent appearance there, nor do we know whether it was picked from the rocks or only from the beach. Even in the south of England it is rare, and still more so in Ireland; in the south of Europe it is rather more plentiful, extending nearly to the southern limits of the temperate zone.

It has now been separated from its congener, and certainly if such species as *Rhodymenia laciniata*, *reniformis*, and *palmata* must stand in separate genera, we can see no propriety in retaining the present in its old position, as the structure, habit, and fructification of the two plants are all different. The grouping of the spores in the present species into irregular spots or zones, is quite different from the regularly formed *sori* of the next species; and the spores themselves are still more different, being entire in the present species and obliquely cruciate in the next, separating at maturity into four sporules.

EXPLANATION OF PLATE CLVII.

Figs. 1.—*Taonia atomaria*, natural size.
2.—Portion of frond with sorus.
3.—Same, more magnified.
4.—Cells of the surface.
5.—Spores from sorus. All magnified.

Taonia atomaria Ag.

Plate CLVIII.

DICTYOTA DICHOTOMA.—*Lamour.*

Gen. Char.—Frond membranaceous, flat, without midrib, irregularly dichotomous, cellular; cells large, quadrate; root, a mass of woolly fibres. Fructification: scattered clusters of spores (tetraspores), beneath the surface of the frond, through which they finally burst, or on distinct plants; single spores (?) similarly scattered under the surface. Name from δίκτυον, "a net," referring to the reticulated structure.

Dictyota *dichotoma*.—Frond scarcely stalked, regularly dichotomous; segments linear, suberect; axils and apices rounded; spores mostly collected in roundish oval sori.

Dictyota *dichotoma*.—*Lamour. Ess.* p. 58; *Grev. Alg. Brit.* p. 57, t. 10; *Hook. Br. Fl.* vol. ii. p. 280; *Wyatt, Alg. Danm.* No. 10; *Duby, Bot. Gall.* p. 954; *Menegh. Alg. Ital. et Dalm.* p. 224; *Endl.* 3rd Suppl. p. 24; *Mont. Fl. Alg.* p. 30; *Harv. P. B.* plate 103; *Harv. Man.* p. 39; *Harv. Syn.* p. 33; *Atlas*, plate 10, fig. 37; *Harv. N. B. A.* part 1, p. 109; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 92.

Zonaria *dichotoma*.—*Ag. Sp. Alg.* vol. i. p. 133; *Ag. Syst.* p. 266; *Hook. Fl. Scot.* vol. ii. p. 90; *Grev. Fl. Edin.* p. 297.

Dichophyllium *vulgare*.—*Kütz. Phyc. Gen.* p. 337, t. 22; vol. ii. f. 1–4.

Dichophyllium *dichotomum*.—*Kütz.* l. c. p. 338.

Haliseris *dichotoma*.—*Spreng. Syst. Veg.* vol. iv. p. 328.

Ulva *dichotoma*.—*Huds. Fl. Angl.* 2nd edit. p. 568, 1st edit. p. 476; *Lightf. Fl. Scot.* p. 975, t. 34; *With. Br. Pl.* vol. iv. p. 124; *Engl. Bot.* t. 774; *Lyngb. Hyd. Dan.* p. 31, t. 6 c.

Var. β, *intricata*.—Frond very narrow, irregularly branched and twisted.

Dictyota *dichotoma*, β *intricata*.—*Grev. Alg. Brit.* p. 58; *Menegh. Alg. Ital. et Dalm.* p. 227; *Harv. P. B.* plate 103; *Harv. Man.* p. 39.

Dictyota *dichotoma*, β *implexa*.—*J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 92.

Dictyota *implexa*.—*Lamour.* l. c.; *J. Ag. Alg. Medit.* p. 37; *Mont. Fl. Alg.* p. 30.

Dichophyllium *implexum*.—*Kütz. Phyc. Gen.* p. 338.

Hab.—Parasitical on various Algæ, also growing on stones, old shells, and rocks in tide-pools, as well as in deep water. Annual. Summer. Both varieties common.

Geogr. Dist.—Atlantic Ocean from the Norwegian shores to the tropic; Southern Ocean; Western shores of South America; Cape of Good Hope; New Zealand.

Description.—Root minute, covered with matted fibres. Stem, scarcely

any, subcylindrical, immediately expanding into the frond, which is flat, regularly dichotomous from near the base; segments linear, suberect, from a quarter of an inch to three inches in length, the edges entire, and the apices rounded, forked, emarginate, or entire. Fronds from three to nine or twelve inches in length, and from one to four lines in breadth; the upper slightly narrower. Substance consisting of rather large quadrate cells, disposed in linear longitudinal series, membranaceous, very tender and delicate, scarcely adhering to paper. Colour, a pale olive brown, sometimes dark brown towards the base. In our specimens of variety β *intricata* the segments are gradually narrower upwards, the ultimate ones almost filiform and patent; all much twisted and entangled. Fructification forming minute dark dots or sori under the whole surface of the frond; each sorus consisting of numerous spores or tetraspores, attached by their apices and enveloped in a pellucid limbus, and, when mature, divided in an obliquely cruciate manner into four sporules.

We have not seen any specimens of var. β with fruit. Could its slender and delicate habit arise from its having grown under shade or in confined situations? The whole plant is much more delicate, the upper segments being almost filiform, very much crisped and entangled, and the apices often almost divaricate; both varieties are said to grow together.

Specimens also vary very much in colour, some being entirely of a pale brownish olive, scarcely darker to the base, while others are pale brownish olive at the apices, and dark brown or almost black towards the base.

The sori are often disposed to run into lines, but the lines are more frequently longitudinal than transverse, the grouping is never so apparent as those of the spores in the preceding species, and they extend almost to the very base of the frond.

EXPLANATION OF PLATE CLVIII.

Fig. 1.—*Dictyota dichotoma*, natural size.
2.—Portion of frond with sorus.
3.—Portion of frond with scattered spores.
4.—Section of sorus.
5.—Spores. All magnified.

Dictyota dichotoma. Lamour.

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Plate CLIX.

STILOPHORA RHIZODES.—*J. Ag.*

Gen. Char.—Frond filiform, cylindrical, solid or tubular, cellular, much branched; branches irregularly dichotomous. Fructification: obovate spores, nestling among hemispherical wart-like tufts of clavate jointed filaments, scattered over the surface. Name from στίλη, "a point or dot," and φορέω, "to bear;" alluding to the dots of fructification.

Stilophora *rhizodes*. — Frond solid when young, much branched; branches irregularly dichotomous, ramuli mostly forked; fructification, scattered over the whole frond.

Stilophora *rhizodes*.—*J. Ag. Linn.* vol. xv. p. 6; *Endl.* 3rd Suppl. p. 26; *Harv. P. B.* plate 70; *Harv. Man.* p. 39; *Harv. Syn.* p. 33; *Atlas*, plate 10, fig. 38; *Harv. N. B. A.* part 1, p. 112; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 85.

Spermatochnus *rhizodes*.—*Kütz. Phyc. Gen.* p. 335.

Sporochnus *rhizodes*.—*Ag. Sp. Alg.* vol. i. p. 156; *Ag. Syst.* p. 260; *Spr. Syst. Veg.* vol. iv. p. 329; *Grev. Alg. Brit.* p. 43, t. 6; *Hook. Br. Fl.* vol. ii. p. 275; *Harv.* in *Mack. Fl. Hib.* part 3, p. 173; *Wyatt, Alg. Danm.* No. 5; *Harv. Man.* 1st edit. p. 27 (excl. var. β).

Chordaria *rhizodes*.—*Ag. Syn.* p. 15; *Lyngb. Hyd. Dan.* p. 52, t. 13.

Fucus *rhizodes*.—*Turn. Hist.* t. 235.

Conferva *rhizodes*.—*Ehr.* in *Herb.*

Conferva *gracilis*.—*Wulf. Crypt. Aquat.* No. 23.

Conferva *verrucosa*.—*E. Bot.* t. 1688.

Ceramium *tuberculosum*.—*Roth, Cat. Bot.* vol. ii. p. 162.

Hab.—On rocks, stones, and parasitically on other Algæ, near low-water mark. Annual. Summer. Common on the southern shores of England, and on the eastern, southern, and western shores of Ireland; Belfast Bay and Strangford Lough (*Mr. Thompson*); Jersey, Rothesay (*Rev. G. Laing*); Lamlash Bay (*Major Martin*).

Geogr. Dist.—Atlantic shores of Europe and North America; Baltic Sea.

Description.—Root minute, naked. Frond solitary or slightly tufted, six inches to a foot or more in length, and scarcely half a line in diameter, filiform, cylindrical, much branched from near the base; branches irregularly dichotomous, sometimes secund, sometimes alternately pinnated, all the divisions subpatent, with rounded axils, the ultimate ramuli at one time long, slender, and simple, at another short, forked, or repeatedly dichotomous, all tapering to a fine point; in some specimens

the branches are short and excessively divided, in others they are few, long, slender, and often simple. The structure of the frond is cellular, the cells growing gradually smaller towards the circumference, roundish polygonal; when young it is quite solid, but when old is traversed by a very slender tube. Substance cartilaginous, scarcely adhering to paper until after long steeping. Fructification, forming roundish, hemispherical, or elliptical wart-like tubercles over the whole surface of the frond, giving it a rough and warted appearance, even to the naked eye. The warts are composed of clavate, moniliform filaments, to the base of which are attached by their apices obovate spores, surrounded by a pellucid limbus. Colour, a pale yellowish brown.

This singular plant was until lately a congener of *Sporochnus pedunculatus*, a species to which the present has some resemblance; but it is too unimportant to allow of their associating well together under the modern hair-splitting ideas of classification. Both the structure of the plant and the mode of fructification are considerably different.

The fruit is generally produced in great abundance, as we have never seen specimens without, and is scattered very closely over the whole surface of the frond.

It seems rather an Irish than an English species, and is not of frequent occurrence in Scotland. In Ireland it is said to be not uncommon all round the coast, but in England has only been found on the extreme southern shores, where, however, it is common; the only English specimens we have seen are from Falmouth Bay, where they were collected by Miss Warren.

EXPLANATION OF PLATE CLIX.

Fig. 1.—*Stilophora rhizodes*, natural size.
2.—Portion of a branch with sori.
3.—Transverse section of same.
4.—Section of sorus.
5.—Spore.
6.—Surface cells. All magnified.

STILOPHORA Rhizodes. J. AG.

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Plate CLX.

STILOPHORA LYNGBYÆI.—*J. Ag.*

Gen. Char.—Frond filiform, cylindrical, solid or tubular, cellular, much branched; branches irregularly dichotomous. Fructification: obovate spores, nestling among hemispherical wart-like tufts of clavate jointed filaments, scattered over the surface. Name from στίλη, "a point or dot," and φορέω, "to bear;" alluding to the dots of fructification.

Stilophora *Lyngbyæi.*— Frond tubular from the first, "at length distended," much branched; branches dichotomous, patent, much attenuated to the summit; axils wide, rounded; apices much acuminated; sori mostly disposed in transverse lines, arising from branching filaments.

Stilophora *Lyngbyæi.—J. Ag. Symb.* vol. i. p. 6; *Sp. Alg.* vol. i. p. 84; *Endl.* 3rd Suppl. p. 26; *Harv. P. B.* plate 237; *Harv. Man.* p. 40; *Harv. Syn.* p. 34; *Atlas*, plate 10, fig. 39; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 84.

Scytosiphon *paradoxus.—Fl. Dan.* t. 1595, f. 2.

Spermatochnus *paradoxus.—Kütz. Phyc. Gen.* p. 335.

Chordaria *paradoxa.—Lyngb. Hyd. Dan.* p. 53, t. 14.

Striaria *Grevilleana.—Pollexf. MS.*

Sporochnus *rhizodes*, β *paradoxa.—Ag. Sp. Alg.* vol. i. p. 157; *Grev. Alg. Brit.* p. 43; *Hook. Br. Fl.* vol. ii. p. 275; *Harv. Man.* 1st edit. p. 27.

Hab.—On mud and sand, in from three to twelve fathoms water. Annual. Summer. Common on the shores of Ireland and Scotland.

Geogr. Dist.—Baltic Sea; Atlantic coasts of Europe; Mediterranean Sea.

Description.—Root, a minute naked disc. Frond thickest at the base, gradually tapering upwards to a capillary fineness, tubular from the first, cylindrical, from one to two or even "six feet in length," much branched; branches mostly dichotomous, sometimes fastigiate or alternate; all the divisions very patent, axils very patent and rounded. Structure cellular, cells large in the centre, smaller towards the circumference. Stem, in a very early stage, perhaps quite solid, very soon becoming tubular by the disappearance of the large central cells, "at length very much distended" downwards, "with a wide tube and thin walls." Substance, "when recent, crisp, and very brittle," afterwards more tough and flaccid, and closely adhering to the paper. Colour,

when fresh, a pale olive brown, when old, a pale yellowish brown. Fructification: minute, obovate spores, attached to and nestling among moniliform, clavate branching filaments, which form hemispherical wart-like masses, arranged in more or less regular spiral bands running round the whole of the frond almost from the base.

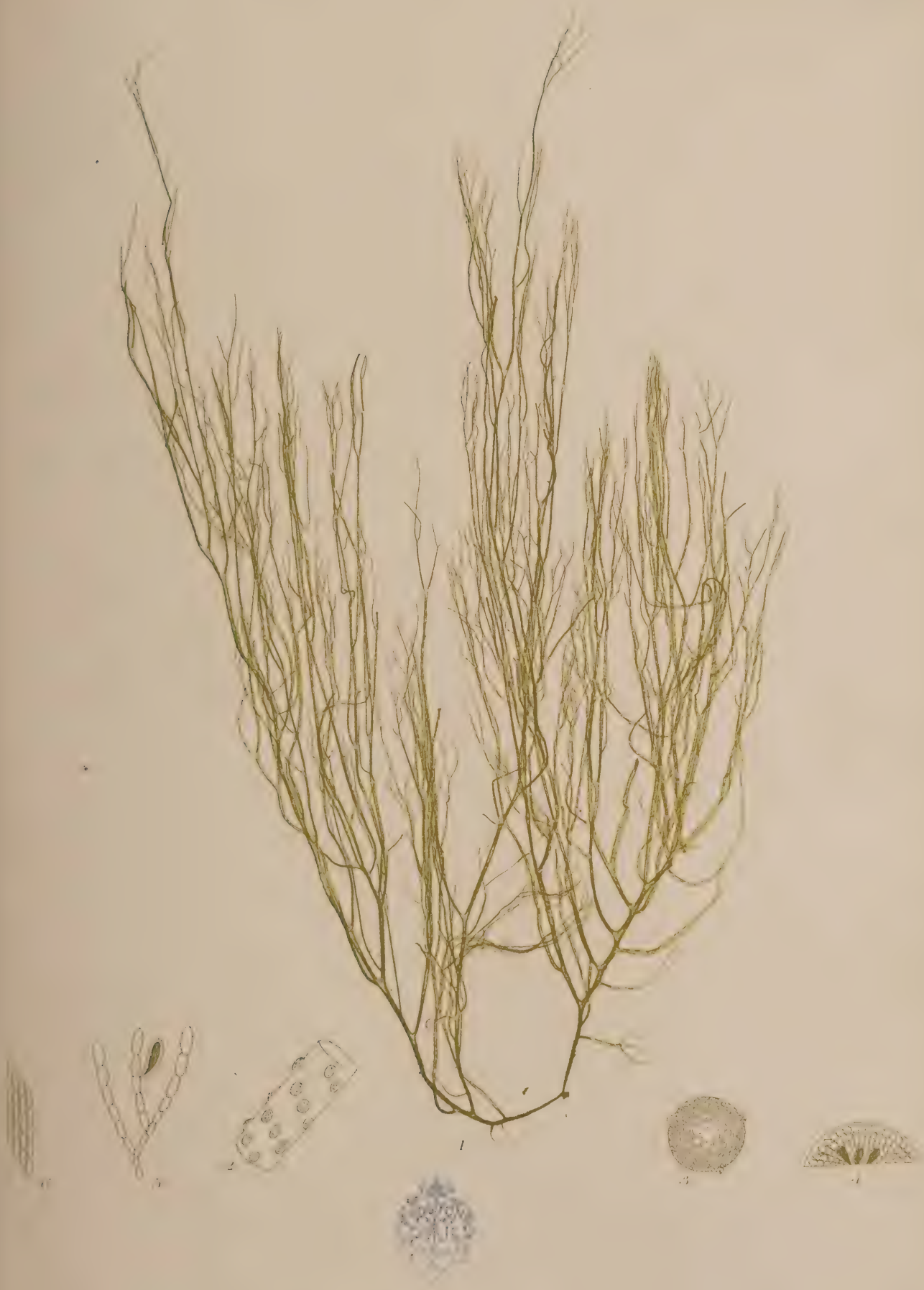
The present plant is still looked upon by many as a variety of the preceding, which it very closely resembles, differing chiefly in the more distended and tubular stem or base of the frond, and the more regular disposition of the sori in spiral bands.

We have not seen recent specimens of the plant, but suspect that in a very young state the frond must be solid, and that the hollowness arises from the breaking up of the lax cellular tissue of the axis; ultimately the whole of these large cells disappear, and nothing remains in old plants except the more minutely cellular periphery. The differences in the characters, we are assured in the *Phycologia Britannica*, are increased with the depth of the water in which the plant vegetates, and are, moreover, such as are generally consequent on growing in deeper water, and are such as are found in other species when growing under similar circumstances; so that upon the whole the claims of this plant to specific distinction rest, we fear, on rather insecure footing, even in the present age of species-making notoriety.

As a species it is said to be more common in Scotland and Ireland than in England, but we have not seen either Scotch or Irish specimens, ours being from Falmouth Bay, obligingly communicated by Miss Warren.

EXPLANATION OF PLATE CLX.

Fig. 1.—*Stilophora Lyngbyæi*, natural size.
2.—Portion of branch with sori.
3.—Transverse section of same.
4.—Section of sorus.
5.—Filaments from sorus.
6.—Surface cells. All magnified.



Stilophora Lyngbyæi. J. Ag.

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Plate CLXI.

DICTYOSIPHON FÆNICULACEUS.—*Grev.*

Gen. Char.—Frond cellular, inner cells oblong, disposed in longitudinal series; outer minute, quadrangular, filiform, cylindrical, tubular, capillaceo-multifid. Fructification: "solitary or aggregated naked spores scattered irregularly over the surface." Name from *δίκτυον*, "a net," and *σίφων*, "a tube."

Dictyosiphon *fæniculaceus.* — Frond cylindrical, capillaceo-multifid; primary branches long, secondary short, scattered, very rarely opposite; spores scattered, partially immersed.

Dictyosiphon *fæniculaceus.*—*Grev. Alg. Brit.* p. 56, t. 8; *Hook. Br. Fl.* vol. ii. p. 279; *Wyatt, Alg. Danm.* No. 205; *Kütz. Sp. Alg.* p. 485; *Aresch. Phyc. Scand.* p. 147, t. 6, 7, 8 (in part); *E. Bot.* Suppl. t. 2746; *Harv.* in *Mack. Fl. Hib.* part 3, p. 176; *Harv. P. B.* plate 326; *Harv. Man.* p. 40; *Harv. Syn.* p. 35; *Atlas*, plate 10, fig. 40; *Harv. N. B. A.* part 1, p. 114; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 82.

Scytosiphon *fæniculaceus.*—*Ag. Sp. Alg.* vol. i. p. 164; *Ag. Syst.* p. 258; *Lyngb. Hyd. Dan.* p. 63, t. 14.

Fucus *subtilis.*—*Turn. Hist.* t. 234.

Conferva *fæniculacea.*—*Huds. Fl. Angl.* vol. ii. p. 594; *Lightf. Fl. Scot.* vol. ii. p. 981.

Conferva *marina fæniculacea.*—*Dill. Hist. Musc.* p. 16, t. 2, f. 8.

Hab.—On rocks, stones, and parasitically on other Algæ, generally in pools between tide-marks. Annual. Spring and Summer. Common.

Geogr. Dist.—Atlantic shores of Europe and North America; Baltic Sea.

Description.—Root, a minute naked disc. Frond ten to twenty inches in length, capillaceous, much branched; branches irregular, very long and cylindrical, everywhere beset with short, scattered, simple, or capillaceo-multifid ramuli; all the divisions are erecto-patent, the axils rather acute, the apices tapering to a fine point; occasionally they are opposite, but very rarely, and now and then two or three together; when young the frond is covered with short confervoid hairs. Substance cellular, at first solid, the inner cells very large, oblong, arranged in four longitudinal series, and surrounded by similar series of somewhat smaller cells, becoming still smaller to the surface; outer series minute, subquadrate or polygonal, forming an opaque periphery. Substance rather flaccid, generally adhering, but not very tenaciously, to the paper. Colour, a brownish olive. Fructification: roundish elliptical spores, partially immersed in the cells of the periphery, generally single

and scattered, occasionally more or less collected in groups; enclosed in a narrow pellucid limbus.

This rather pretty and delicate Alga is everywhere met with on all our shores, generally growing on rocks and stones, and occasionally on other Algæ in the deeper tide-pools, where its long, soft, conferva-like bundles form a very conspicuous object during spring and summer months. The extreme delicacy of its filaments, and the abundant branching, give a softness and a woolliness to the entire aspect of the plant, scarcely observed in any other species. In spring and early summer, when the plant is yet covered with the thin transparent robes of its early youth, so soft and delicate is the mass, that when lifted out of the water it retains so much of the fluid, that it looks almost like a mass of dark fibrous jelly, and when squeezed in the hand it pours out the water like a sponge.

We are informed in *Phyc. Brit.* that Areschoug considers this merely a state of *Chordaria flagelliformis* without the coating of radiating filaments that form the periphery in that species, having found branches with both kinds of structure on the same plant, and a suggestion is there offered that we may have more than one species confounded under the present. The *Dictyosiphon* is very commonly parasitical on *Chordaria*. Could it be possible that the great Swedish naturalist could have mistaken such a circumstance and been deceived by two branches thus occurring together or even attached? a young plant, for instance, of *Dictyosiphon* attached to the *Chordaria* might very readily be mistaken for parts of the same plant. We have been often very much puzzled with them under such circumstances.

The present species has considerable resemblance to *Desmarestia viridis*, and may readily be mistaken for it, but the invariably opposite branches in that species, and the articulated upper ramuli, will always serve to distinguish them.

Dr. Harvey also mentions having specimens collected on the west coast of Ireland, in which the fruit is collected in clusters, as in *Striaria*, but not disposed in transverse bands, and that such specimens exhibited also a somewhat different habit from ordinary ones.

EXPLANATION OF PLATE CLXI.

Fig. 1.—*Dictyosiphon fœniculaceus*, natural size.
2.—Longitudinal section of old branch.
3.—Transverse section of same.
4.—Longitudinal section of young branch and spores.
5.—Transverse section of young branch.
6.—Spores.
7.—Apex of a branch. All magnified.

Dictyosiphon foeniculaceus. Grev.

Nature Printed by Henry Bradbury.

Plate CLXII.

STRIARIA ATTENUATA.—*Grev.*

Gen. Char.—Frond cellular, membranaceous, tubular, tube continuous. Fructification: groups of naked roundish spores, forming transverse rings round the frond. Name from *striæ*, "lines," in allusion to the transverse lines of fructification.

Striaria *attenuata*.—Frond filiform, much branched ; branches mostly opposite or ternate, much attenuated towards each end.

Striaria *attenuata*.—*Grev. Crypt. Fl.* (syn.) p. 44; *Alg. Brit.* p. 55, t. 9; *Hook. Br. Fl.* vol. ii. p. 279; *Harv.* in *Mack. Fl. Hib.* part 3, p. 176; *Wyatt, Alg. Danm.* No. 160; *Meneg. Alg. Ital. et Dalm.* p. 157; *J. Ag. Alg. Medit.* p. 41; *Endl.* 3rd Suppl. p. 26; *Kütz. Phyc. Gen.* p. 336, t. 21, f. 2; *Harv.* in *Hook. Journ. Bot.* vol. i. p. 298; *M'Calla, Alg. Hib.* No. 18; *Harv. P. B.* plate 25; *Harv. Man.* p. 41 *Harv. Syn.* p. 35; *Atlas*, plate 11, fig. 41; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 80.

Scytosiphon *olivascens*.—*Carm. MSS.*

Carmichaelia *attenuata*.—*Grev. Sc. Crypt.* t. 288.

Zonaria *Naccariana*.—*Ag. MSS.*; *Nac. Fl. Ven.* vol. vi. p. 94; *Alg. Adr.* p. 82.

Zonaria *lineolata*.—*Ag.* in *Diar. Ratisb.* 1827; *Ag. Alg. Eur.* t. 40.

Stilophora *crinita*.—*Ag. Aufzahl.* p. 17; *Nac. Fl. Ven.* vol. vi. p. 94; *Alg. Adr.* p. 83.

Solenia *crinita*.—*Ag. Syst.* p. 186.

Solenia *attenuata*.—*Ag. Syst.* p. 187.

Ulva *attenuata*.—*Nac. Fl. Ven.* vol. vi. p. 72.

Dictyota *lineolata*.—*Grev. Syn.* pl. 43.

Conferva *crinita*.—*Ruch. Fl. Ven.* p. 269.

Hab.—Parasitical on the smaller Algæ, growing usually beyond tide range. Annual. Summer. Not uncommon all round the coasts.

Geogr. Dist.—British Islands ; Coast of Sweden (*Areschoug*) ; Mediterranean Sea.

Description.—Root, a minute disc. Fronds tufted, five to eight inches long or more, and from a quarter of a line to one or two lines in diameter at the middle, from which they are gradually attenuated to each end; main stem percurrent, much branched, almost from the base, with mostly opposite, rarely alternate, frequently ternate pinnæ, exactly similar to the main stem, and these are again once or twice pinnated with branches of a similar form, all much attenuated to each

end, patent; the axils wide but not rounded, all the apices very much acuminated, and frequently forked, the forks long and slender. Structure cellular; cells large, quadrate, forming a thin hollow cylinder. Substance delicately membranous, and closely adhering to the paper. Colour, a rather pale yellowish olive. Fructification: roundish spores, collected into roundish dot-like sori, which form transverse rings round the whole of the frond at a distance of a quarter of a line apart; the spores are of a dark olive colour, and enveloped in a thin pellucid limbus.

We are informed in *Phyc. Brit.* that the present plant was first noticed as British by the late Captain Carmichael, of Appin, a most indefatigable and accurate observer among the marine Algæ of his coast, and one to whom the British botanist is indebted for much information respecting the Algæ of the west coast of Scotland. Since his discovery of the present species in 1826, it has been observed both in England and Ireland, but is by no means common. The only specimens we have seen are from Plymouth, a locality extremely favourable to the growth of Algæ.

From the species of the two preceding genera it may be readily known by the much wider tube, its thin walls, the very much attenuated bases of the branches, the grouping of the naked spores, and the different arrangement of the groups.

Its favourite habitat is said to be in quiet sheltered bays with a rather soft bottom, preferring, however, to grow parasitical on other Algæ to the trouble of laying a foundation for itself on the rocks.

EXPLANATION OF PLATE CLXII.

Fig. 1.—*Striaria attenuata*, natural size.
2.—Branch with part of its ramulus.
3.—Surface cells and sorus.
4.—Spores. All magnified.

STRIARIA attenuata. GREV.

Nature Printed by Henry Bradbury.

Plate CLXIII.

PUNCTARIA LATIFOLIA.—*Grev.*

Gen. Char.—Frond gelatinoso-membranous, flat, without midrib. Fructification external, scattered over the whole surface of the frond, consisting of roundish ovate spores, mixed with short, articulated, club-shaped filaments, and forming little tufts or sori. Name from *punctum*, "a point or dot," in allusion to the dots of fructification.

Punctaria *latifolia.*— Frond oblong, obovate or irregularly lanceolate, very shortly stalked, and very tender.

Punctaria *latifolia.—Grev. Alg. Brit.* p. 52; *Hook. Br. Fl.* vol. ii. p. 278; *Mack. Fl. Hib.* vol. iii. p. 176; *Wyatt, Alg. Danm.* No. 9; *J. Ag. Alg. Medit.* p. 41; *Endl.* 3rd Suppl. p. 25; *Meneg. Alg. Ital.* p. 174; *Harv. P. B.* plate 8; *Harv. Man.* p. 41; *Harv. Syn.* p. 36; *Atlas*, plate 11, fig. 42; *Harv. N. B. A.* part 1, p. 116; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 73.

Phycolapathum *debile.—Kütz. Phyc. Gen.* p. 292, t. 24, II. (in part).

Hab.—On rocks, stones, and old shells in the sea. Annual. Summer. Not uncommon on the English coasts; rather rare in Scotland. West of Ireland, common.

Geogr. Dist.—British Islands; Mediterranean Sea; Trieste (*Herb. Hooker*).

Description.—Root, a flat, hard, naked disc. Frond with a short cylindrical stalk from one to three lines long, and not much thicker than a stout horse-hair, obovate, oblong or lanceolate, the margin straight, entire, or slightly and irregularly sinuated, plane or more or less waved and curled; apex generally rounded and very obtuse, sometimes tapering to an obtuse point, base similar, surface quite flat. Structure of rather small quadrate cells, arranged in longitudinal lines. Substance membranous and very delicate, but imperfectly adhering to paper. Colour, a very pale olive green. Fructification: minute, roundish ovate spores, collected in little groups, mixed with short elliptical or clavate filaments, and scattered over the whole surface of the frond.

This fine species is as liable to be confounded with *Laminaria debilis* (the broad form), as the following species is with *L. facia* (the narrow form). They are still, however, sufficiently distinct both in size and form to separate the species, and when the present is in fruit there can be no difficulty at all.

We have not met with this species in Scotland, and judging from the

few specimens that have come under our observation, it does not seem to be common. From what we have seen, it appears abundantly distinct from *P. plantaginea*, although the varieties often very closely approximate. It does not appear that the colour of the present species is so apt to become brown as that of the following, all the specimens that we have seen being of a peculiarly pale olive green, similar to that of *P. tenuissima*, while that of *P. plantaginea* is, when young, of a darker olive, which soon changes to a brownish olive, and at length to a rusty or dark umber brown, and when old often becomes very much infested by parasites, as *Ceramium rubrum*, &c.

EXPLANATION OF PLATE CLXIII.

Fig. 1.—*Punctaria latifolia*, natural size.
2.—Surface cells and sori.
3.—Section of frond.
4.—Section of sorus.
5.—Spores detached. All magnified.

Punctaria latifolia, Grev.

Colour Printed by Henry Bradbury

Plate CLXIV.

PUNCTARIA PLANTAGINEA.—*Grev.*

Gen. Char.—Frond gelatinoso-membranous, flat, without midrib. Fructification external, scattered over the whole surface of the frond, consisting of roundish ovate spores, mixed with short, articulated, club-shaped filaments, and forming little tufts or sori. Name from *punctum*, "a point or dot," in allusion to the dots of fructification.

Punctaria *plantaginea*.—Frond membranaceous, rather thick, linear-lanceolate or elliptic-lanceolate, generally much attenuated to the base, brown when old.

Punctaria *plantaginea*.—*Grev. Alg. Brit.* p. 53, t. 9; *Hook. Br. Fl.* vol. ii. p. 278; *Wyatt, Alg. Danm.* No. 206; *Endl.* 3rd Suppl. p. 25; *Harv.* in *Mack. Fl. Hib.* part 3, p. 175; *Harv. P. B.* plate 128; *Harv. Man.* p. 41; *Harv. Syn.* p. 36; *Atlas*, plate 11, fig. 43; *Harv. N. B. A.* part 1, p. 115; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 73.

Diplostromium *plantagineum*.—*Kütz. Phyc. Gen.* p. 298.

Zonaria *plantaginea*.—*Ag. Sp. Alg.* vol. i. p. 138; *Ag. Syst.* p. 268; *Spreng. Syst. Veg.* vol. iv. p. 326.

Ulva *plantaginea*.—*Roth, Cat. Bot.* vol. ii. p. 243, and vol. iii. p. 326; *E. Bot.* t. 2136.

Ulva *plantaginifolia*.—*Wulf. Crypt.* No. 3; *Lyngb. Hyd. Dan.* p. 31, t. 6.

Laminaria *plantaginea*.—*Ag. Syn.* p. 20.

Hab.—On stones, old shells, and rocks in pools between tide-marks; occasionally on Algæ. Annual. Spring and summer. Not uncommon at irregular intervals all round the English, Irish, and Scottish Coasts.

Geogr. Dist.—Atlantic shores of Europe.

Description.—Root, a minute disc. Frond subcylindrical, filiform at the base, very slender, three to six lines in length, and scarcely thicker than a stout hair, gradually expanding to the middle or nearly to the summit, then tapering to an obtuse point, forming a more or less narrow-lanceolate or elliptic-lanceolate frond, six to ten inches or a foot in length, and from a quarter of an inch to one and a-half inch in breadth; when perfect generally tapering into a somewhat obtuse point at the summit, which is the normal form, but, especially in old fronds, the tapering summit is more or less abraded as in similar species; the margin generally slightly waved, and mostly quite entire, but occasionally split down into two or more laciniæ, at first,

perhaps, by accident; the surface smooth and somewhat polished when young, more or less rough when old. Structure loosely reticulated, with large quadrate cells. Substance membranous, more or less coriaceous when old, and then not adhering to paper. Colour, a rather dark greenish olive, becoming of a rusty brown or a dark umber brown when old. Fructification consisting of roundish ovate, very minute spores, collected into little roundish oblong groups or sori, mixed with short, ovate, jointed filaments, and scattered abundantly over the whole surface of the frond.

When clean and well grown, this is a very pretty species, but by the time it is full-grown it very often becomes more or less the prey of other parasitical species, and is torn or abraded in the upper part, so that the original elliptic-lanceolate form is lost.

In this battered form it often survives till the next summer, when its surface and edges become quite shaggy with parasites, and its reticulations become so filled up with their radicles, that its structure becomes almost obliterated.

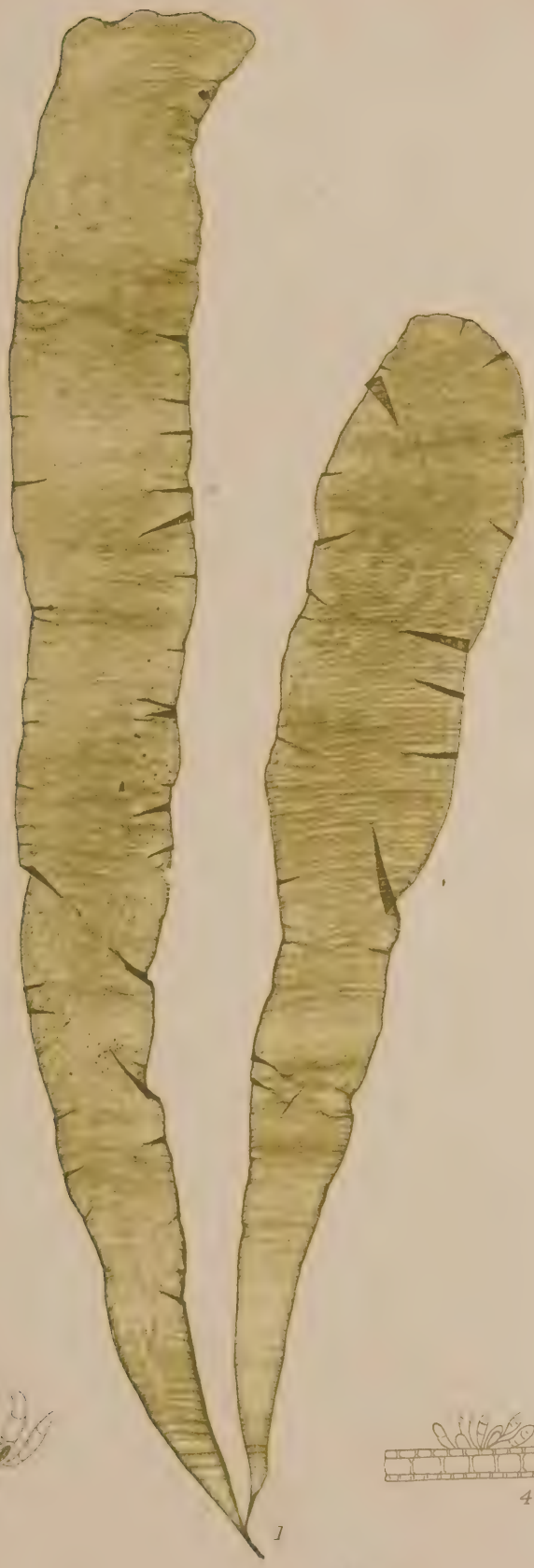
In its habit it is not only tufted but cæspitose, often forming extensive patches either along the shallow margins of the pools or on isolated stones, which it frequently envelopes with a shaggy covering which hangs gracefully down on all sides, very much in the manner of *Ulva linza*, and gracefully waving backwards and forwards with each retreating or returning wave.

At first the colour is a rather pleasant olive green without much gloss, but the older parts soon become tinged with brown, and this colour gradually spreads upwards until the whole frond is of an ochry brown colour, and very little of the original olive tint remains.

From the last species it may be distinguished by the narrow elliptical outline, larger reticulations, brown colour, and rather thicker substance, and the narrow states from *Laminaria fascia* by the reticulated structure, dull surface without gloss, and brown colour.

EXPLANATION OF PLATE CLXIV.

Fig. 1.—*Punctaria plantaginea*, natural size.
2.—Surface of frond with sorus.
3.—Same with antheridia ?
4.—Transverse section of frond.
5.—Sorus.
6. -Spores from same.
7.—Antheridia ? All magnified.



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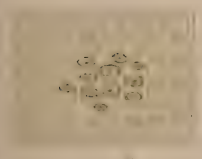

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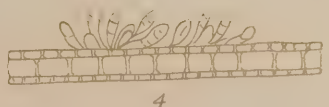

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PUNCTARIA plantaginea. GREV.

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PUNCTARIA TENUISSIMA.—*Grev.*

Gen. Char.—Frond gelatinoso-membranous, flat, without midrib. Fructification external, scattered over the whole surface of the frond, consisting of roundish ovate spores, mixed with short, articulated, club-shaped filaments, and forming little tufts or sori. Name from *punctum*, "a point or dot," in allusion to the dots of fructification.

Punctaria *tenuissima.*—Frond very tender, sublinear, attenuated to a slender base, and to an obtuse point at the summit.

Punctaria *tenuissima.*—*Grev. Alg. Brit.* p. 54; *Hook. Br. Fl.* vol. ii. p. 279; *Harv. P. B.* plate 248; *Harv. Man.* p. 42; *Harv. Syn.* p. 37; *Atlas*, plate 13, fig. 51; *Harv. N. B. A.* part 1, p. 115.

Punctaria *undulata.*—*J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 72.

Ulva *plantaginifolia.*—*Lyngb.* p. 31, t. 6 (fide *J. Ag.*).

Diplostromium *plantagineum.*—*Kütz. Phyc. Gen.* p. 298.

Hab.—Parasitical on *Chorda filum*, &c., near low-water mark. Annual. Summer. Not uncommon.

Geogr. Dist.—Atlantic shores of Northern Europe; Baltic Sea; North-west coast of France; North America.

Description.—Root, a minute disc. Frond scarcely stalked, at once widening into a narrow sublinear or linear-ovate frond, gradually tapering from a point a little above the base into a long, acuminate, obtuse point; occasionally the apex is obliquely truncate or suddenly acuminated into a short point; the margin more or less waved or curled, and occasionally furnished with a few distant teeth. Structure consisting of rather large quadrate cells. Substance very delicate, submembranaceous, rather firmly adhering to paper. Colour, a pale yellowish olive. Fructification: the only appearance of anything analogous to this which we have seen, is numerous small roundish granules, sometimes single, sometimes in pairs, but more frequently collected in small groups, and scattered over the whole surface of the frond. These seem to be identical with what are described in *Phyc. Brit.* under the last species as *antheridia*, which they may either be or the spores in a nascent state.

This pretty delicate species is by no means uncommon; at least we have sometimes met with it in considerable plenty, while at other times, in the same locality, scarcely any could be found. Indeed it seems not only of uncertain appearance, but very evanescent in its

duration. In the early part of the summer of 1858, it was gathered in the neighbourhood of Montrose in great profusion, in some pools almost covering everything within reach, not even confined to the plants, but frequently scattered over the rock itself, although apparently preferring *Halidrys siliquosa*, which it sometimes so completely covered as to entirely conceal it. Two weeks after, on visiting the same spot, scarcely a single frond of the *Punctaria* remained. During the interval a storm had occurred, the greater part of the plants had been swept away, and in 1859 very little of it has been observed.

In all the specimens we have seen, the widest part of the frond was near the base, the upper part being long, tapering, and very slender, and generally acuminated to a very sharp point. Occasionally, however, the apex is very short and abrupt, but always acute.

In colour and substance this comes nearest *P. latifolia*, but the areolation most resembles *P. plantaginea*, from which, however, it differs in outline, as well as in colour and in its much more delicate substance. *P. plantaginea* we have never met with parasitical, while *P. tenuissima* is generally so, and only when in profusion found scattered over the neighbouring rocks. It seems always to grow in pools, and generally near high-water mark.

PUNCTARIA TENUISSIMA.

EXPLANATION OF DISSECTIONS.

1.—Surface of frond.
2.—Surface of frond with antheridia ?
3.—Antheridia ? All magnified.

Plate CLXV.

ASPEROCOCCUS COMPRESSUS.—*Griff.*

Gen. Char.—Frond membranaceous, simple, tubular, cylindrical or compressed. Fructification: external, minute, roundish ovate spores collected in little groups or sori, mixed abundantly with club-shaped filaments, and scattered over the whole surface of the frond. Name improperly formed from the Latin *asper*, "rough," and the Greek κόκκος, "fruit," in allusion to the roughness formed on the surface by the fructification.

Asperococcus *compressus*.—Frond from a narrow subcylindrical base, linear or linear-lanceolate, obtuse or slightly acuminated; sori oblong.

Asperococcus *compressus*.—*Griff. MSS.*; *Hook. Br. Fl.* vol. ii. p. 278; *Wyatt, Alg. Danm.* No. 8; *J. Ag. Alg. Medit.* p. 41; *Menegh. Alg. Ital.* p. 164, t. 4. f. 1; *Endl.* 3rd Suppl. p. 26; *Harv. P. B.* plate 72; *Harv. Man.* p. 42; *Harv. Syn.* p. 37; *Atlas*, plate 11, fig. 44; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 77.

Haloglossum *Griffithsianum*.—*Kütz. Phyc. Gen.* p. 340.

Hab.—Parasitical on Algæ in the sea. Annual. Summer. South of England and Jersey, not uncommon.

Geogr. Dist.—Southern shores of England; Mediterranean Sea; Cherbourg; Cape Finisterre; Cape of Good Hope (*Dr. Harvey*).

Description.—Root, a minute disc. Frond from a narrow, short, subcylindrical base, gradually widening into a narrow linear or linear-lanceolate frond, six to fifteen inches or more in length, and from six to sixteen lines in breadth, widest about the middle, the base or stem not much thicker than a stout hair, the apex more or less obtuse or rounded, and but slightly narrowed, the surface flat, rather smooth when young, but very rough to the feel when old and covered with fruit, the margin straight or slightly waved, tubular, but so compressed that the two sides are nearly in contact, and often united by transverse jointed filaments. Structure consisting of an inner layer of large quadrate cells, and an outer of minute roundish cellules. Substance membranaceous, imperfectly adhering to paper. Colour, a pale yellowish olive, the green mostly vanishing in age. Fructification: minute, roundish oval spores, immersed among tufts of club-shaped filaments scattered over the surface of the frond.

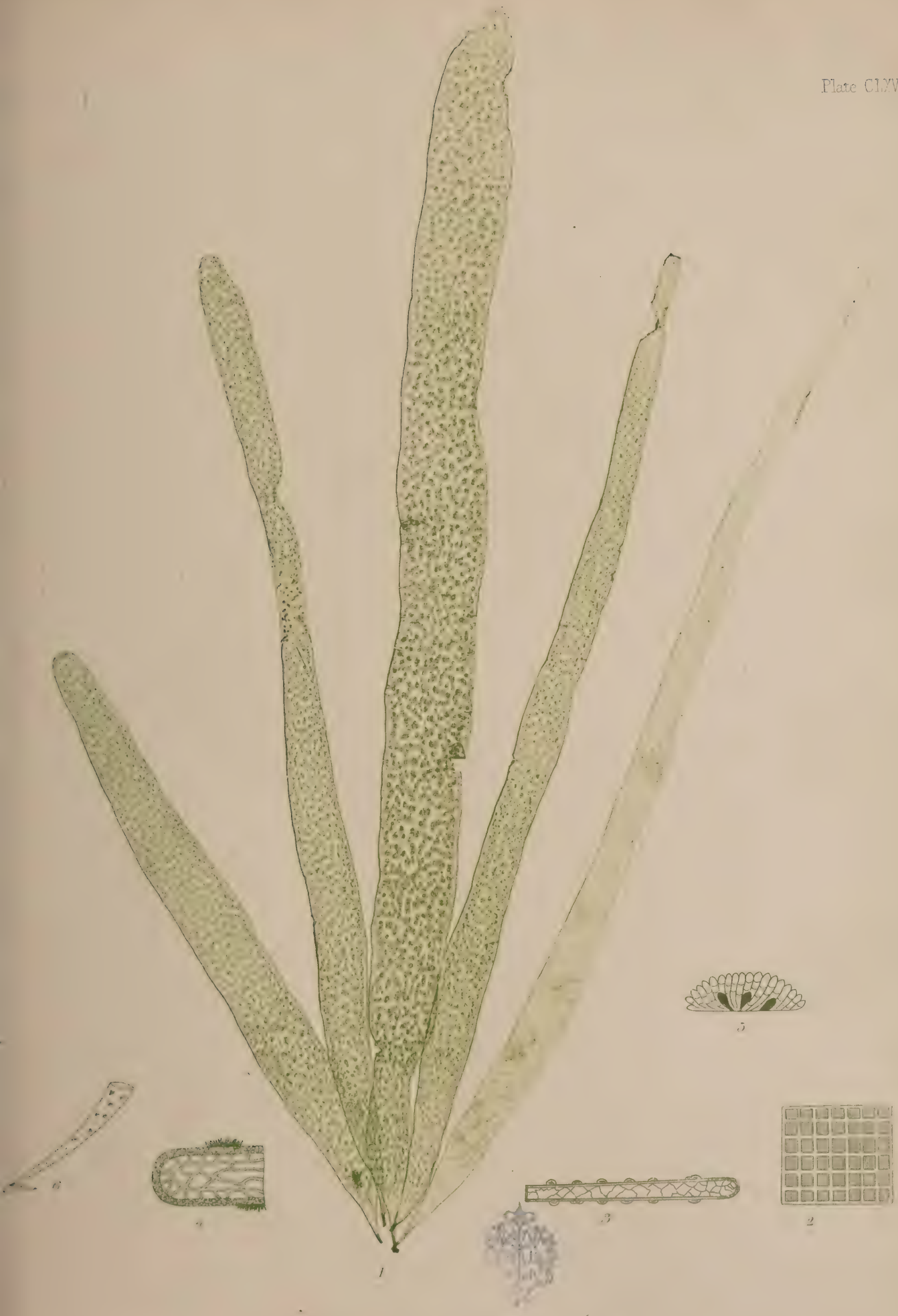
Very closely related to the species of the preceding genus, between

which and the following it seems almost intermediate, but the two membranes of which the frond is composed are but very imperfectly united here and there by scattered slender filaments, and these as the frond advances in age, often become disrupted, and the tube becomes more or less perfect. In the fructification also, there is a very close resemblance, but in the present species the club-shaped filaments are more abundant.

We are informed in *Phyc. Brit.* that Kützing has proposed it as the type of a new genus, and certainly, in these days of hair-splitting, it might be possible to take a less proper course, although the generic characters would certainly not be of the most satisfactory kind.

EXPLANATION OF PLATE CLXV.

Fig. 1.—*Asperococcus compressus*, natural size.
2.—Surface of frond.
3.—Section of same.
4.—Same, more magnified.
5.—Sorus.
6.—Base of frond. All magnified.



ASPERococcus Compressus. GRIFF.

Lithographed by Henry Bradbury.

ASPEROCOCCUS TURNERI.—*Hook.*

Gen. Char.—Frond membranaceous, simple, tubular, cylindrical or compressed. Fructification: external, minute, roundish ovate spores collected in little groups or sori, mixed abundantly with club-shaped filaments, and scattered over the whole surface of the frond. Name improperly formed from the Latin *asper*, "rough," and the Greek κόκκος, "fruit," in allusion to the roughness formed on the surface by the fructification.

Asperococcus *Turneri*.—Frond cylindrical, tubular, inflated upwards, very obtuse, and suddenly contracted at the base into a short cylindrical stem; sori roundish.

Asperococcus *Turneri*.—*Hook. Br. Fl.* vol. ii. p. 277; *Wyatt, Alg. Danm.* No. 59; *Harv.* in *Mack. Fl. Hib.* part 3, p. 175; *Harv. P. B.* plate 11; *Harv. Man.* p. 42; *Harv. Syn.* p. 37; *Atlas*, plate 12, fig. 45.

Asperococcus *bullosus*.—*Lamour. Ess.* p. 62, t. 6, f. 5; *Grev. Alg. Brit*, p. 51; *Endl.* 3rd Suppl. p. 26; *J. Ag. Alg. Medit.* p. 41; *Menegh. Alg. Ital. et Dalm.* p. 166; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 77.

Asperococcus *rugosus*, β *bullosus*.—*Duby, Bot. Gall.* vol. ii. p. 956.

Encælium *bullosum*.—*Ag. Sp. Alg.* vol. i. p. 146; *Syst.* p. 262; *Spreng. Syst. Veg.* vol. iv. p. 328; *Kütz. Phyc. Gen.* p. 326, t. 21, f. 1.

Gastridium *opuntia*.—*Lyngb. Hyd. Dan.* p. 71, t. 18.

Ulva *Turneri*.—*Dillw. Eng. Bot.* t. 2570.

Hab.—On stones and the larger Algæ, in the sea, often to the depth of six fathoms. Annual. Summer and autumn. All round our coasts.

Geogr. Dist.—Atlantic coasts of Europe from Norway to Spain (*Lyngb.*); Baltic; Mediterranean and Adriatic Seas; Southern Ocean (*Agardh*).

Description.—Root, a minute flattened disc. Stem short, cylindrical, three to eight lines in length, and a quarter of a line in thickness, suddenly becoming inflated into an oblong or cylindrical frond, commonly from six to twelve inches in length, and from half an inch to an inch and a-half in diameter, but occasionally from sixteen to forty-two inches in length, and two to four inches in diameter, generally more or less cylindrical, but often with occasional inflations and contractions, and frequently more or less curved or twisted and plaited. Structure consisting of rather small quadrate cells, forming the periphery, and lined internally by an open network of bars or nerves, forming large irregularly polygonal meshes or cells, somewhat in the manner of the nerves on the back of some leaves or in the wing of a dragon-fly. Substance membranous, rather flaccid when young, and more or less adhering

to paper, but when old scarcely adhering. Colour, pale yellowish or greenish olive when young, umber brown when old. Fructification: minute roundish elliptical spores, collected in little groups or sori on the surface of the frond, and mixed with short, articulated, club-shaped filaments, simple or with few short ramuli. The dots or sori are at first round, but they often become confluent, thus assuming an oblong or irregular form, and sometimes run together in patches.

This fine species seems more generally distributed than the preceding, and to find its northern limit at a much higher latitude. Although it does not seem to be common in Scotland, it is occasionally met with on our shores. It was detected at Appin by Captain Carmichael (*Phyc. Brit.*). We have received specimens from Arran, and although one of our rarer species, it is not scarce in one or two localities on the Forfarshire coast.

The base of the frond is generally suddenly inflated, but often, as in the figure in *Phyc. Brit.*, the base gradually tapers, sometimes nearly as much as in *A. echinatus*; and although the inflated apices are more constant, yet they too are occasionally tapered to an obtuse point, but rarely so much so as in *A. echinatus*, and in the same tuft fronds will always be observed with the obtuse extremities characteristic of the species. Sometimes the frond is inflated at the summit or blown up like a bladder, but more frequently this part has become torn or abraded, and has a ragged or uneven appearance, and the frond is frequently more or less twisted and contorted or curved round in the form of a hoop.

ASPEROCOCCUS TURNERI.

EXPLANATION OF DISSECTIONS.

Fig. 1.—Surface of frond.
2.—Base of the same.
3.—Spores.
4.—Section of frond. All magnified.

Plate CLXVI.

ASPEROCOCCUS ECHINATUS.—*Grev.*

Gen. Char.—Frond membranaceous, simple, tubular, cylindrical or compressed. Fructification: external, minute, roundish ovate spores collected in little groups or sori, mixed abundantly with club-shaped filaments, and scattered over the whole surface of the frond. Name improperly formed from the Latin *asper*, "rough," and the Greek *κόκκος*, "fruit," in allusion to the roughness formed on the surface by the fructification.

Asperococcus *echinatus*. — Frond tubular, cylindrical, acute, much attenuated towards the base, often contorted.

Asperococcus *echinatus*.—*Grev. Alg. Brit.* p. 50, t. 9; *Endl.* 3rd Suppl. p. 26; *Harv. P. B.* plate 194; *Harv. Man.* p. 43; *Harv. Syn.* p. 38; *Atlas*, plate 12, fig. 46; *Harv. N. B. A.* part 1, p. 117; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 76.

Asperococcus *fistulosus*.—*Hook. Br. Fl.* vol. ii. p. 277; *Wyatt, Alg. Danm.* No. 7; *Harv.* in *Mack. Fl. Hib.* part 3, p. 175.

Asperococcus *rugosus*.—*Lamour. Ess.* p. 62.

Encælium *echinatum*.—*Ag. Sp. Alg.* vol. i. p. 145; *Ag. Syst.* p. 261; *Spreng. Syst. Veg.* vol. iv. p. 328; *Kütz. Phyc. Gen.* p. 336.

Encælium *Lyngbyanum*.—*Grev. Crypt.* t. 290.

Scytosiphon *filum*, var. *fistulosum*.—*Ag. Sp.* vol. i. p. 163; *Ag. Syst.* p. 258.

Ulva *fistulosa*.—*Huds. Fl. Angl.* p. 569; *E. Bot.* t. 642; *Hook. Fl. Scot.* part 2, p. 92.

Conferva *fistula*.—*Roth, Cat. Bot.* vol. iii. p. 169.

Var. β.—Frond setaceous, filiform, twisted.

Asperococcus *echinatus*, β *vermicularis*.—*Harv. P. B.* plate 194; *Harv. Man.* p. 43; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 76.

Asperococcus *vermicularis*.—*Moore, Ord. Surv. Londonderry, Bot.* p. 9; *Wyatt, Alg. Danm.* No. 207.

Hab.—On stones, shells, &c., between tide marks. Annual. Spring, summer and autumn. Common on the British shores.

Geogr. Dist.—Atlantic coasts of Europe and America; Southern Ocean at Lord Auckland's Islands (*Dr. Hooker*).

Description.—Root, a minute disc. Frond from a slender cylindrical base, gradually thickened to about one-third from the apex, then tapering to a rather acute point, very much tufted, eight to twelve

inches in length, scarcely one-fourth of a line in diameter at the base, and from one line to half an inch in diameter at the widest part, the apex generally acute, surface smooth when young, rough when old, frequently constricted, inflated, or contorted. Fructification: minute roundish spores, nestling among short, cylindrical, articulated filaments, collected into small roundish spots or sori, and scattered over the whole surface of the frond. Structure consisting of rather large roundish cells mixed with smaller ones, forming a more or less cylindrical tube, with rather thick walls. Substance soft and flaccid when young, and closely adhering to paper; when old, hard and not adhering. Colour, when young, a greenish olive brown; when old, entirely brown.

This is an exceedingly common species, frequenting shallow stony pools between tides, often near high-water mark, where the small contorted form may often be observed mixed in the same tuft with the larger and more luxuriant state. When young, it is not by any means an unhandsome plant; but as it advances in age it often becomes covered with mud and innumerable minute parasites, which give it a very coarse and unsightly appearance.

From the last species it may be readily distinguished by its thicker and less delicate substance, attenuated extremities, and more regularly tufted habit. From *E. compressus* it is best known by the more obtuse extremities and compressed frond of that species, and its more evident reticulations.

From *Chorda lomentaria*, when young, it is often no easy matter to distinguish it. In maturity, the vertical filaments of the periphery, and the smooth surface, as well as the more regular and more numerous constrictions, are pretty conspicuous characters in that species.

We have also seen it confounded with *Dumontia filiformis*, but that species is always more or less branched, of a very different colour and substance, and very smooth surface.

EXPLANATION OF PLATE CLXVI.

Fig. 1.—*Asperococcus echinatus*, natural size.
2.—Base of stem.
3.—Portion of stem.
4.—Section of frond with spores.
5.—Surface cells of same. All magnified.

Asperococcus echinatus, Grev.

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LITOSIPHON PUSILLUS.—*Harv.*

Gen. Char.—Frond unbranched, cylindrical and cartilaginous, subsolid, at length tubular, composed of several rows of cells; the surface areolated. Fructification: solitary or aggregated naked spores, scattered irregularly over the surface of the frond. Name from λίτος, "slender or mean," and σίφον, "a tube" (*Phyc. Brit.*).

Litosiphon *pusillus.*—Fronds cæspitose, slender, and filiform, cylindrical; surface reticulated, and clothed with pellucid hair-like filaments, "spores scattered."

Litosiphon *pusillus.*—*Harv. P. B.* plate 270; *Harv. Man.* p. 43; *Harv. Syn.* p. 38; *Atlas*, plate 13, fig. 52.

Chlorosiphon *pusillus.*—*Harv.* in *Phyc. Brit.* vol. i. p. 10 (in list of species); *Kütz. Sp. Alg.* p. 484.

Asperococcus *pusillus.*—*Carm.* in *Hook. Br. Fl.* vol. ii. p. 277; *Wyatt, Alg. Danm.* No. 58; *Harv.* in *Mack. Fl. Hib.* part 3, p. 175; *Harv. Man.* 1st edit. p. 35; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 78.

Hab.—Parasitical on *Chorda filum.* Annual. Summer. Very common everywhere.

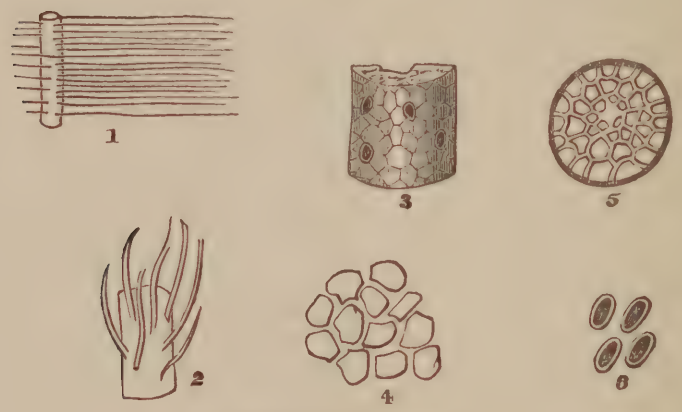
Geogr. Dist.—Shores of Europe.

Description.—Fronds densely cæspitose, covering the whole surface of the plant affected with it with a dense wool-like covering, often for a considerable extent, generally from two to three inches in length, and scarcely thicker than a stout hair, cylindrical, filiform, the surface at first covered with abundance of minute, pellucid, jointed hairs scattered over the surface; as it advances to maturity these gradually disappear, the surface becomes smooth, but less lubricous, and less adhesive. Structure cellular, at first quite solid, at length hollow by the decay of the internal parts; the inner cells being partly empty and larger, irregularly hexagonal, those near the surface filled with olive brown endochrome. Substance very soft and lubricous, especially when young, and closely adhering to paper. Colour, a pale olive brown. "The surface, under the microscope, appears reticulated with quadrate cells, which are disposed in longitudinal lines. Among these cells one is here and there larger and more prominent than the rest, containing a darker coloured endochrome; these are supposed to be the spores, and no other fructification has yet been observed."

A frequent parasite on old fronds of *Chorda filum*, which it often covers for a considerable extent, giving it the appearance of a bottle-

brush, but very soft and lubricous, so that when the plant is removed from the water it becomes closely appressed to the stem of the *Chorda*, and is scarcely otherwise apparent than by a slight thickening, but when placed in water the fronds of the parasite stand out at right angles in all directions, and are straight, waved, or variously contorted. In this condition it has rather a handsome appearance, and when growing in deep water, waving its long, intricate, snake-like coils in the rising and falling swell, a less appropriate object might be selected as an idea for the notorious sea-serpent. It is rarely, however, that the whole of the frond is covered by the parasite, although it often does so to the extent of several feet.

The fructification is still but imperfectly understood. We have never seen perfect spores, although cells apparently filled with a denser endochrome are not scarce, and very much resemble those already referred to in the description of *Punctaria tenuissima*.



LITOSIPHON PUSILLUS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Litosiphon pusillus*, on *Chorda filum*, natural size.
2.—Apex of a frond.
3.—Semisection of same and spores.
4.—Surface cells.
5.—Section of young frond.
6.—Spores. All magnified.

LITOSIPHON LAMINARIÆ.—*Harv.*

Gen. Char.—Frond unbranched, cylindrical and cartilaginous, subsolid at length, tubular, composed of several rows of cells; the surface areolated. Fructification: solitary or aggregated, naked spores, scattered irregularly over the surface of the frond. Name from λίτος, "slender or mean," and σίφον, "a tube."—*Phyc. Brit.*

Litosiphon *Laminariæ.*—Fronds in stellate corymbose tufts, somewhat clavate upwards, attenuated towards the base, smooth or with a few scattered hair-like filaments towards the extremities; cells quadrate, arranged in circular bands; "spores solitary in the transverse rows of cells."

Litosiphon *Laminariæ.—Harv. P. B.* plate 295; *Harv. Man.* p. 43; *Harv. Syn.* p. 39; *Atlas*, plate 13, fig. 53.

Desmotrichum *Laminariæ.—Kütz. Sp. Alg.* p. 470.

Chlorosiphon *Laminariæ.—Harv.* in *Phyc. Brit.* vol. i. p. x. (list of species).

Bangia *Laminariæ.—Lyngb. Hyd. Dan.* p. 84, t. 24; *Ag. Syst.* p. 75; *Hook. Br. Fl.* vol. ii. p. 316; *Harv.* in *Mack. Fl. Hib.* part 3, p. 241; *Harv. Man.* 1st edit. p. 172.

Asperococcus (?) *Laminariæ.—J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 79.

Hab.—Parasitical on *Alaria esculenta.* Annual. Summer and autumn. Very common.

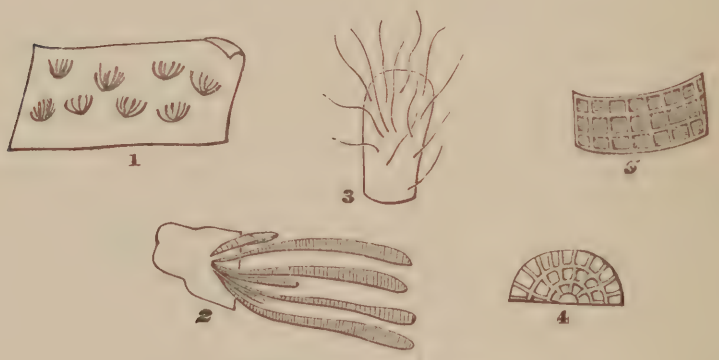
Geogr. Dist.—Atlantic shores of Europe.

Description.—Fronds forming minute stellate tufts, frequently so numerous as to become confluent, uniform, of equal length, often covering parasitically the whole of the plant on which they grow. The filaments are more or less clavate, attenuated to the base; apices rounded, with generally a few scattered hairs. Structure cellular, solid; cells irregularly quadrate, those of the periphery arranged in circular bands round the frond. Substance very soft and flaccid, adhering closely to paper. Colour, a brownish olive, yellowish when young. Fructification: "spores scattered, one or more in each transverse band, each spore formed from a cell of the band, become enlarged and prominent" (*Phyc. Brit.*), where we are also informed that "the cells sometimes form into four smaller cells, which occupy the space of one large cell."

We have not been able to find the fruit of this curious little plant, although the fronds are by no means unfrequent, covering mostly the upper part of the *Alaria*, on which alone we have met with it, with its

pretty little stellate tufts, which are sometimes so abundant as to become confluent, and occasionally extend their domain over the whole of the frond, giving it quite a shaggy appearance. At other times the tufts are minute, dot-like, or partly so, and are thinly scattered, somewhat like the fruit of *Punctaria*, but differing widely under the microscope.

The only other plant with which the present can be confounded is *Elachista fucicola*, which sometimes asserts its right to colonise in the same locality, but the uniformity in the length of the fronds will at a glance distinguish the present species, together with the knob-like base of the *Elachista*.



LITOSIPHON LAMINARIÆ.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—Tufts of *Litosiphon Laminariæ*, on *Alaria esculenta*, natural size.
2.—Same.
3.—Apex of a frond.
4.—Semisection of same.
5.—Surface cells. All magnified.

PLATE CLXVII.

CHORDARIA FLAGELLIFORMIS.—*Ag.*

GEN. CHAR.—Frond cellular, solid, filiform, cylindrical, consisting of two strata of cells; the inner oblong, arranged in longitudinal filamentous series, the outer in vertical, short, club-shaped filaments. Fructification: obovate spores, attached, near the base, to the filaments of the periphery. Name from *chorda*, "a chord."

CHORDARIA *flagelliformis.*—Fronds furnished throughout with numerous scattered, mostly simple, filiform branches; filaments of the periphery clavate.

CHORDARIA *flagelliformis.*—*Ag. Syn.* p. 12; *Lyngb. Hyd. Dan.* p. 51, t. 13; *Ag. Sp. Alg.* vol. i. p. 166; *Ag. Syst.* p. 256; *Hook. Fl. Scot.* part 2, p. 98; *Grev. Fl. Edin.* p. 288; *Grev. Alg. Brit.* p. 44, t. 7; *Hook. Fl. Brit.* vol. ii. p. 275; *Wyatt, Alg. Danm.* No. 57; *Kütz. Phyc. Gen.* p. 332, t. 27, f. 3; *Endl.* 3rd Suppl. p. 23; *Harv.* in *Mack. Fl. Hib.* part 3, p. 183; *Harv. P. B.* plate 111; *Harv. Man.* p. 46; *Harv. Syn.* p. 39; *Atlas*, plate 12, fig. 47; *Harv. N. B. A.* part 1, p. 123; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 66.

GIGARTINA *flagelliformis.*—*Lamour. Ess.* p. 48.

FUCUS *flagelliformis.*—*Fl. Dan.* t. 650; *Turn. Syn.* vol. ii. p. 335; *Turn. Hist.* t. 85; *E. Bot.* t. 1222.

HAB.—On rocks, stones, old shells, &c., in the sea, between tide-marks. Annual. Summer. Everywhere common.

GEOGR. DIST.—Atlantic shores of Europe from Iceland to France, abundant; Eastern coast of North America; Cape of Good Hope.

DESCRIPTION. — Root, a minute spreading disc. Frond filiform, cylindrical, very slightly attenuated at the base and apex, furnished throughout, except a small portion at each end, with long, slender, mostly simple branches, all filiform, cylindrical, the lower ones longest, with occasionally one or two short ramuli; all erecto-patent. The main stem is generally simple, but occasionally once or twice divided, and is generally percurrent, but sometimes greatly overtopped by the lateral branches, and is frequently beset at the base with short spine-like branchlets, apparently the remains of such as have been broken off, as they are not always present. Structure: the axis composed of densely packed, longitudinal, articulated filaments, much interlaced, and frequently anastomosing, the joints oblong, twice or thrice as long as broad. The periphery of closely packed, vertical, clavate, articu-

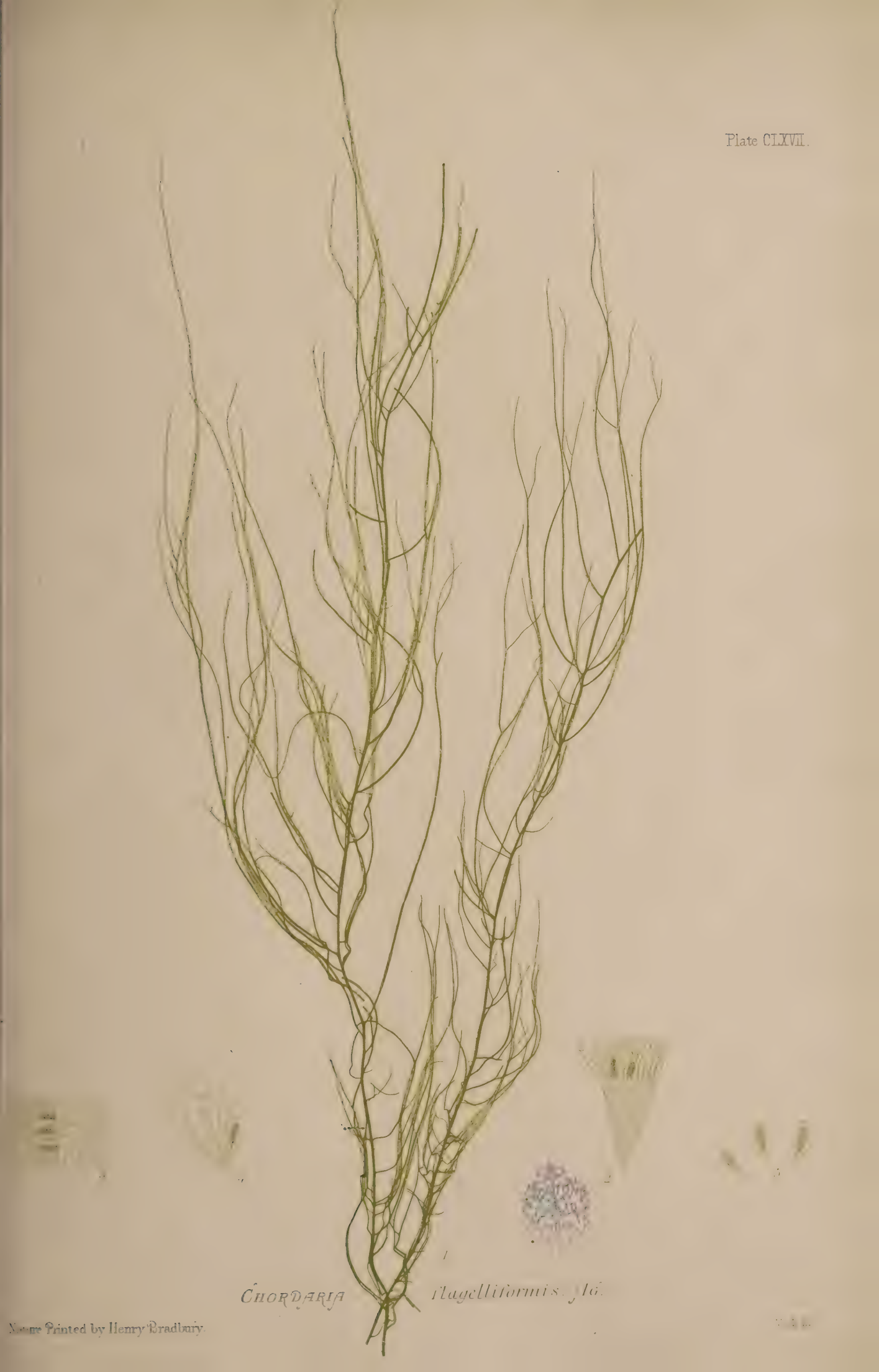
lated filaments, with joints rather longer than broad, the apical one much enlarged and spherical at maturity. Fructification : obovate spores surrounded with a narrow pellucid limbus, and attached to the filaments of the periphery near the base. Substance somewhat cartilaginous, very soft and lubricous on the outside, and closely adhering to the paper, to which it communicates a brownish stain. Colour, a very dark greenish brown.

This species is by no means of rare occurrence in tide-pools, and in the little channels which issue from them, forming often large flagelliform bundles; a number often grow together in society, but never or rarely from the same root.

The main stem is generally simple, but in luxuriant specimens sometimes repeatedly divided, each division forming a distinct, much branched, flagelliform frond of its own. Occasionally also one or more of the branches assumes the form of the primary, and becomes covered with numerous branches in a similar manner, but most frequently they are simple, with here and there a short, simple, or forked ramulus; occasionally, too, the primary branches are forked at their apices, and we have seen specimens in which they arose mostly in fascicles from the same point, giving the plant a very singular appearance. We are informed in *Phyc. Brit.* that this species was at one time confounded with *Gracilaria confervoides*, with which, however, it will be readily seen that it only agrees in the external appearance of the filiform frond.

EXPLANATION OF PLATE CLXVII.

Fig. 1.—*Chordaria flagelliformis*, natural size.
2.—Transverse section of frond.
3.—Longitudinal section of same.
4.—Filaments of the periphery.
5.—Spores. All magnified.



CHORDARIA flagelliformis. fig.

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CHORDARIA DIVARICATA.—*Ag.*

Gen. Char.—Frond cellular, solid, filiform, cylindrical, consisting of two strata of cells; the inner oblong, arranged in longitudinal filamentous series, the outer in vertical, short, club-shaped filaments. Fructification: obovate spores, attached, near the base, to the filaments of the periphery. Name from *chorda*, "a chord."

Chordaria *divaricata*.—"Frond irregularly divided; branches divaricate, subdichotomous, flexuous, furnished towards the apices with short, very patent, mostly forked ramuli; filaments of the periphery capitate."

Chordaria *divaricata*.—*Ag. Syn.* p. 12; *Ag. Sp. Alg.* vol. i. p. 165; *Syst.* p. 256; *Endl.* 3rd Suppl. p. 23; *Harv. P. B.* plate 17; *Harv. Man.* p. 46; *Harv. Syn.* p. 40 *Atlas*, plate 12, fig. 48; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 65.

Mesogloia *divaricata*.—*Kütz. Phyc. Gen.* p. 332.

Hab.—Thrown up from deep water, at Carrickfergus, near Belfast, Oct. 1845 (*Mr. M'Calla*). Annual. Autumn.

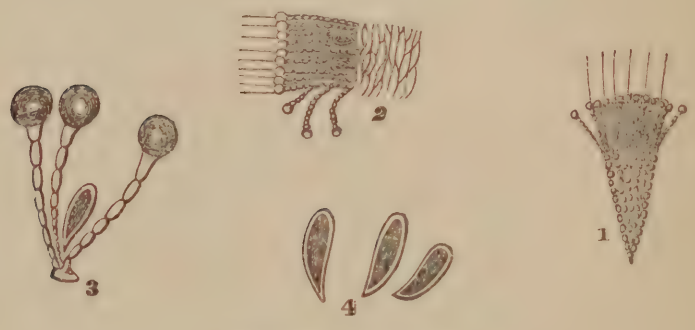
Geogr. Dist.—Baltic Sea (*Agardh*); Belfast Lough.

Description.—Root, a minute disc. Fronds filiform, cylindrical, five to fifteen inches or more in length, and about a quarter of a line in diameter, repeatedly branched from the base in an irregularly dichotomous manner; main stem simple and percurrent or repeatedly dichotomous, main branches distant or fascicled, much divided, all the divisions very patent or divaricated, often curved; the apices forked or multifid, the ultimate ramuli short and somewhat more erect. "The surface of the whole frond is slimy, and clothed with long, byssoid, gelatinous fibres, which spread in all directions, and when the plant is floating in the water add greatly to its apparent diameter. These are imperfectly preserved in a dry state."—*Phyc. Brit.* Structure of the axis filamentous; filaments articulated, compact, interlacing, and anastomosing, joints oblong, about three times as long as broad; those of the periphery slightly clavate, the apical cell very large and capitate. Substance gelatinous, very soft and lubricous, and closely adhering to paper. Colour, a pale greenish olive, brown in age. "Spores affixed to the bases of the filaments of the periphery, obovate, bright olive, plentiful on our specimens."—*Phyc. Brit.*

Our specimens of this are very imperfect; as a species it seems abundantly distinct from the preceding, both in structure and ramification.

The filaments of the periphery are more slender, the joints rather longer in proportion to their breadth, the apical joint very large and capitate; the branches are very patent, and covered with an abundance of very slender confervoid filaments.

There is something curious in the history of this species. It seems to have been unknown except as an inhabitant of the Baltic, until discovered on the shores of Belfast Lough, by Mr. M'Calla, who found it thrown up apparently from deep water, and scattered in abundance along the shore for miles. Since then it has been found floating in Plymouth Harbour by Mr. F. Pascoe, but we are not informed in what quantity, and have not heard of its occurrence elsewhere, or of its being again observed in these localities. Beyond some imperfect Irish specimens, we have not met with the plant, but have repeatedly received slender branched varieties of the preceding doubtfully referred to the present. From that it may readily be known by its numerous, very patent, irregularly dichotomous branches.



CHORDARIA DIVARICATA.

EXPLANATION OF DISSECTIONS.

Fig. 1.—Transverse section of frond.
2.—Longitudinal section of same.
3.—Filaments of the periphery.
4.—Spores. All magnified.

Plate CLXVIII.

MESOGLOIA VERMICULARIS.—*Ag.*

Gen. Char.—Frond gelatinous, filiform, subcylindrical, much and irregularly branched, of two strata of cells; those of the axis arranged in longitudinal filamentous series; those of the periphery forming vertical dichotomous moniliform series; those at the apices clustered, frequently club-shaped, simple, moniliform. Fructification: obovate spores, attached near the base of the apical fibres. Name from μέσος, "the middle," and γλοιὸς, "viscid," alluding to the very gelatinous nature of the fronds.

Mesogloia *vermicularis*.—Frond subcylindrical, much and irregularly branched from the base; branches patent, somewhat fusiform, attenuated to the base and apex; all the apices obtuse, the axils very much rounded.

Mesogloia *vermicularis*.—*Ag. Syn.* p. 126; *Lyngb. Hyd. Dan.* p. 190, t. 65; *Ag. Syst.* p. 51; *Wyatt, Alg. Danm.* No. 100; *Kütz. Phyc. Gen.* p. 332, t. 27, f. 1; *Menegh. Alg. Ital. et Dalm.* p. 279; *Endl.* 3rd Suppl. p. 23; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 387; *Harv. P. B.* plate 31; *Harv. Man.* p. 47; *Harv. Syn.* p. 40; *Atlas*, plate 14, fig. 55; *Harv. N. B. A.* part 1, p. 126; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 58.

Trichocladia *vermicularis*.—*Harv.* in *Mack. Fl. Hib.* part 3, p. 186.

Helminthocladia *vermicularis*.—*Harv. Gen. S. A. Pl.* p. 397; *Harv. Man.* 1st edit. p. 45.

Rivularia *vermiculata*.—*E. Bot.* t. 1818.

Chætophora *vermiculata*.—*Hook. Fl. Scot.* part 2, p. 75.

Hab.—On rocks and stones in the sea, about half-tide level. Annual. Summer. Common.

Geogr. Dist.—Atlantic shores of Europe; Mediterranean Sea.

Description.—Root, a minute disc. Fronds thickening upwards from a narrow base, often much tufted, six to ten inches or more in length, and one to three lines in diameter, irregularly cylindrical, and very much branched from the base; all the branches patent, with rounded axils and obtuse apices, subcylindrical like the main stem, or somewhat fusiform, subpinnate or irregularly scattered; ultimate ramuli generally short, cylindrical, obtuse. The main stem is generally simple, but occasionally once, or two or three times divided, the divisions forming similar subflabelliform fronds. Structure cellular; the cells of the axis

oblong, clavate, arranged in rather lax filiform series, dichotomously branched and anastomosing; giving out at their joints short, dichotomous filaments, forming the periphery, and formed towards the base of more or less obconical cells, upwards of roundish moniliform cells, those at the apex tufted, simple, clavate, all imbedded in a lax, very abundant gelatine, which closely adheres to the paper in drying. Colour, a fine transparent brownish olive, opaque, brownish when dry. Fructification: obovate spores, sessile at the base of the tufted filaments of the periphery, generally abundant.

This fine species is very generally distributed, and in some places is extremely abundant. On the shores of the Moray Frith, in the months of July and August, it may be gathered in any quantity, and may frequently be met with in the deeper pools near low-water mark, growing parasitically on the other Algæ, as well as on rocks and stones, but is generally thrown up from deep water. Sometimes we have seen this and the beautiful *Polysiphonia byssoides*, forming almost the only rejectamenta on the beach. Yet it seems by no means general on the east coast, as we have not met with it or heard of its occurrence on the coasts of Forfar or Kincardineshire. It seems to delight in large, sheltered bays or friths, its soft delicate fronds being but ill-suited to withstand the rough and boisterous seas on the more exposed parts of the coast. It is a difficult subject to dry, adhering so readily and tenaciously to the paper, that it is no easy matter to prevent it adhering to the sheets as well as to the paper on which it is spread. It is most easily managed without pressure at all, but in that case the fronds contract very much, and do not look so well. When left on the beach by the receding tide, it soon dries in the sun and adheres so tenaciously to the sand or gravel, that from these particles it is difficult afterwards to disengage it, even by washing in water.

EXPLANATION OF PLATE CLXVIII.

Fig. 1.—*Mesogloia vermicularis*, natural size.
2.—Filaments of the axis and periphery.
3.—Filaments of the periphery, separate.
4.—Spores. All magnified.

Mesoglœa vermicularis. Ag.

Nature Printed by Henry Bradbury.

MESOGLOIA GRIFFITHSIANA.—*Grev.*

Gen. Char.—Frond gelatinous, filiform, subcylindrical, much and irregularly branched, of two strata of cells; those of the axis arranged in longitudinal filamentous series; those of the periphery forming vertical, dichotomous, moniliform series; those at the apices clustered, frequently club-shaped, simple, moniliform. Fructification: obovate spores attached near the base of the apical fibres. Name from μέσος, "the middle," and γλοιὸς, "viscid," alluding to the very gelatinous nature of the fronds.

Mesogloia *Griffithsiana*.—Frond slender, equal throughout; branches alternate or irregular, filiform, long, simple, nearly bare of ramuli.—*Phyc. Brit.*

Mesogloia *Griffithsiana*.—*Grev. MS.*; *Hook. Br. Fl.* vol. ii. p. 387; *Wyatt, Alg. Danm.* No. 48; *Kütz. Sp. Alg.* p. 545; *Harv. P. B.* plate 318; *Harv. Man.* p. 47; *Harv. Syn.* p. 41; *Atlas*, plate 14, fig. 56; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 57.

Hab.—In rock-pools between tide-marks, rare. Annual. Summer. Torbay (*Mrs. Griffiths*); Sidmouth (*Miss Cutler*); Roundstone (*Mr. M'Calla*).

Geogr. Dist.—Atlantic shores of Europe.

Description.—Root, a minute disc. Frond cylindrical throughout, very much branched from near the base; branches spreading, scarcely attenuated, long and slender; ramuli few or none, short, simple, patent or divaricate, often a mere tubercle or spine, rarely again branched or forked. Main stem generally simple, six inches to a foot in length, and from half a line to a line in diameter; all the apices obtuse. The structure of this seems much less dense, and the substance much more gelatinous than that of the other species of the genus; the tufted filaments of the periphery forming a larger proportion of the diameter. The stem is either partially tubular or becomes so in age by the premature decay of its axil cells. Colour, "a rather pale olive green, becoming greener in fresh water." When the plant is in a growing state, it is clothed with colourless horizontal fibres, spreading from every portion of the stem and branches, and making them look, when seen under water, of much greater diameter than they really are.

With this species we are very imperfectly acquainted; we have never seen it in the living state, and its structure and substance are too delicate and tender to admit of being revived after being dried so as to show with any satisfactory distinctness its structural characters.

Its character as a species must rest on its structure, not on its branching, as we have met with specimens of the preceding, and often of the following, with only an occasional ramulus on some of the branches. The colour and more cylindrical stem and branches will indeed generally be sufficient to distinguish it from the first, but in many of the varieties of the following species these characters are identical. The tomentum-like covering is scarcely more certain, and is too common a characteristic of the filiform Algæ to be much depended on. All the species contract greatly in drying, and when moistened do not readily regain their original form, this species in particular is so adhesive that it is scarcely possible even to remove the water from it with blotting-paper, without removing the plant.

MESOGLOIA GRIFFITHSIANA.

EXPLANATION OF DISSECTIONS.

Fig. 1.—Portion of a branch.
2.—Section of same.
3.—Portion of same, more magnified.
4.—Filament of the periphery.
5.—Branch. All magnified.

MESOGLOIA VIRESCENS.—*Carm.*

Gen. Char.—Frond gelatinous, filiform, subcylindrical, much and irregularly branched, of two strata of cells; those of the axis arranged in longitudinal filamentous series; those of the periphery forming vertical, dichotomous, moniliform series; those at the apices clustered, frequently club-shaped, simple, moniliform. Fructification: obovate spores attached near the base of the apical fibres. Name from *μέσος*, "the middle," and *γλοιὸς*, "viscid," alluding to the very gelatinous nature of the fronds.

Mesogloia *virescens.* — Frond filiform, much branched; branches long, slender, nearly simple, or more frequently covered with numerous short, simple, or forked ramuli, which are linear, obtuse, and very patent.

Mesogloia *virescens.—Carm. Alg. Appin.* ined.; *Hook. Br. Fl.* vol. ii. p. 387; *Wyatt, Alg. Danm,* No. 49; *Berk. Gl. Alg.* t. 17, f. 2; *Harv. P. B.* plate 82; *Harv. Man.* p. 47; *Harv. Syn.* p. 41; *Atlas,* plate 14, fig. 57; *Harv. N. B. A.* part 1, p. 126; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 56.

Mesogloia *affinis.—Berk. Gl. Alg.* t. 16, f. 2.

Mesogloia *Hornemanni, Suhr?—Kütz. Phyc. Gen.* p. 332?

Tricholadia *virescens.—Harv.* in *Mack. Fl. Hib.* part 3, p. 184.

Helminthocladia *virescens.—Harv. Man.* 1st edit. p. 46.

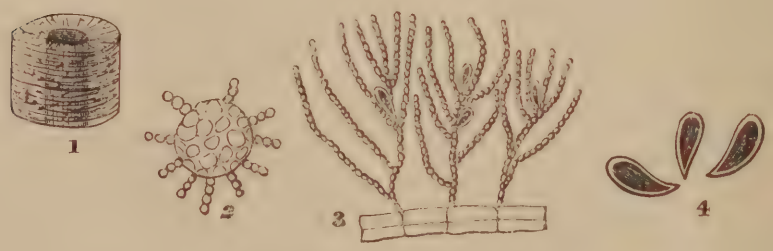
Hab.—On stones, shells, rocks and Algæ, at half-tide level. Annual. Spring. Summer. Common.

Geogr. Dist.—Northern shores of Europe; Baltic Sea; Atlantic coasts of France.

Description.—Root, a minute disc. Fronds single or tufted, three to eight inches or more in length, and scarcely half a line in diameter, cylindrical, filiform, much branched from the base, middle branches longest; branches long, slender, patent, scarcely tapering, generally thickly covered with short, cylindrical, obtuse, very patent, mostly simple ramuli, from an eighth to a quarter of an inch in length. The main stem is generally percurrent, but sometimes in luxuriant specimens it is once or oftener divided in a subdichotomous manner, each division resembling a primary, the long slender branches are often mixed with short ones resembling the ramuli, those at the apex being also gradually but suddenly shortened, and a few at the base are sometimes also abbreviated. Structure: the axis composed of cylindrical cells, arranged in longitudinal filiform series, from which arise numerous vertical, dichotomous, moniliform filaments, forming the periphery. These

filaments are cylindrical, and often much fascicled. Substance very soft and gelatinous, closely adhering to the paper in drying. Colour, a fine somewhat pale olive green. Fructification: roundish obovate spores attached near the base of the filaments of the periphery, generally very abundant.

This pretty species seems very generally distributed, frequenting the shallow pools on low shelving shores, and preferring to grow on the loose stones that frequently occur in these situations. The description in the text applies to the ordinary form of the plant, but the varieties are numerous. Occasionally we have seen it forming a continuous patch over the stone, the stems covered with mostly short, simple branchlets, resembling the ordinary ramuli; at other times the stems are repeatedly divided and copiously furnished with similar branchlets; while again we have seen the branches numerous, long, and slender; the ramuli few, short, and mostly simple. This species is exceedingly soft and lubricous, so much so that it readily slides out of the hand, and when spread out on the paper, can hardly be removed from the water without being jumbled into a mass. It is best managed by removing it from the water, then spreading it out and drying it without pressure. The filaments of the periphery form a beautiful object under the microscope, the tufts of long, slender, moniliform filaments being thickly dotted with the roundish olive brown spores.



MESOGLOIA VIRESCENS.

EXPLANATION OF DISSECTIONS.

Fig. 1.—Portion of frond.
2.—Section of axis.
3.—Filaments of the periphery.
4.—Spores. All magnified.

LEATHESIA TUBERIFORMIS.—*S. F. Gray.*

Gen. Char.—Frond cellular, fleshy, more or less globose; cells of the central portion cylindrical, arranged in radiating dichotomous series; those of the outer portion forming tufted, club-shaped, moniliform filaments. Fructification: obovate spores, produced at the bases of the apical filaments. Name in honour of the Rev. G. R. Leathes.

Leathesia *tuberiformis.* — Fronds, when young, spherical and solid, the centre filled with loose jointed fibres; when old irregularly roundish and hollow.

Leathesia *tuberiformis.*—*S. F. Gray, Nat. Ar. Br. Pl.* vol. i. p. 301; *Harv. P. B.* plate 324; *Harv. Man.* p. 48; *Harv. Syn.* p. 42; *Atlas*, plate 13, fig. 54; *Harv. N. B. A.* part 1, p. 129.

Leathesia *marina.*—*Endl.* 3rd Suppl. p. 23; *Kütz. Sp. Alg.* p. 543; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 52.

Leathesia *difformis.*—*Aresch. Enum. Phyc. Scand.* p. 154, t. 9, f. B.

Corynephora *marina.*—*Ag. Syst.* p. 24; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 390; *Harv. Man.* 1st edit. p. 46; *Wyatt, Alg. Danm.* No. 149; *Grev. Crypt. Scot.* t. 53; *Harv.* in *Mack. Fl. Hib.* part 3, p. 184.

Chætophora *marina.*—*Lyngb. Hyd. Dan.* p. 193, t. 66.

Nostoc *marinum.*—*Ag. Disp.* p. 45, *et Syn.* p. 133.

Tremella *difformis.*—*Linn. Syst. Nat.* p. 714; *Huds. Fl. Angl.* vol. ii. p. 565; *With. Br. Pl.* vol. iv. p. 82.

Rivularia *tuberiformis.*—*E. Bot.* t. 1956.

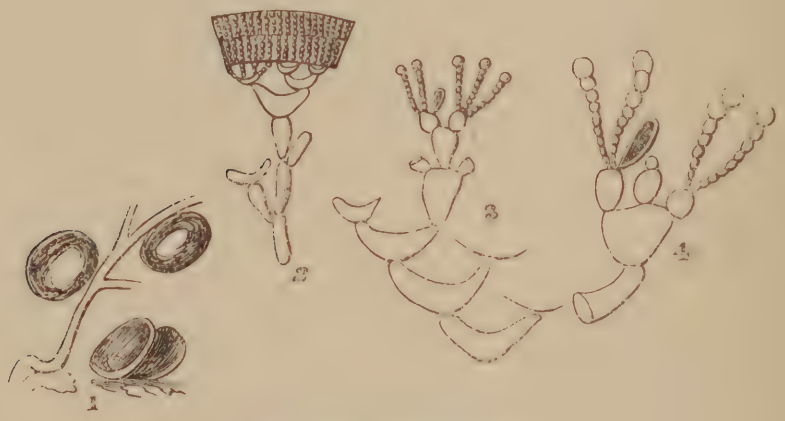
Hab.—On rocks, corallines, and the smaller Algæ, between tide-marks. Very common. Annual. Summer and autumn.

Geogr. Dist.—Atlantic shores of Europe; Baltic Sea; East coast of North America; Cape of Good Hope, common (*Dr. Harvey*).

Description.—Root discoid. Fronds crowded or solitary, when young more or less spherical or obovate and solid, the central portion occupied with loosely interwoven jointed filaments, which eventually decay and leave the frond more or less hollow. Its inner portion is then composed of a stratum of radiating dichotomous filaments, formed of rather long cylindrical joints, and that is succeeded by a stratum of dichotomous filaments, of which the *forked cells* themselves form the bases of the dichotomies. The periphery composed of tufts of densely packed, club-shaped, simple, moniliform, coloured filaments. Substance subcartilaginous, but soft and adhering closely to the paper. Colour brownish

olive. Fructification: obovate spores produced at the bases of the filaments of the periphery.

This curious species is common on all our shores between tides, both on the sides of rocks and in the rock-pools, and, as far as we have been able to ascertain, is generally parasitical on the smaller Algæ, preferring *Laurencia pinnatifida*, *Corallina officinalis*, *Ceramium rubrum*, &c. When growing on the last-named plant they are mostly small, seldom much larger than peas, and generally quite round, but when growing on the stunted varieties of *Laurencia pinnatifida* it is often of large size, and the shape very irregular, especially when old: their size also varies from that of a small pea to that of one or two inches. In Scotland it is in perfection in July and August, after which it soon disappears. Its curious structure forms an interesting object, under the microscope, from the variety and singular forms of the cells. Externally the plant has no great beauty, but that is amply compensated by its curious microscopical structure.



LEATHESIA TUBERIFORMIS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—Fronds of *Leathesia tuberiformis*, natural size.
2.—Portion of a longitudinal slice showing the dense coloured outer wall and the fibres.
3.—Apices of the fibres with club-shaped filaments.
4.—The same with spores. All magnified.

LEATHESIA BERKELEYI.—*Harv.*

Gen. Char.—Frond cellular, fleshy, more or less globose; cells of the central portion cylindrical, arranged in radiating dichotomous series; those of the outer portion forming tufted, club-shaped, moniliform filaments. Fructification: obovate spores, produced at the bases of the apical filaments. Name in honour of the Rev. G. R. Leathes.

Leathesia *Berkeleyi.*—"Fronds dark brown, depressed, fleshy, solid, filaments densely packed."

Leathesia *Berkeleyi.—Harv. P. B.* plate 176; *Harv. Man.* p. 48; *Harv. Syn.* p. 42; *Atlas*, plate 15, fig. 59; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 51.

Chætophora *Berkeleyi.—Grev.* in *Berk. Gl. Alg.* t. 1, fig. 2; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 390; *Wyatt, Alg. Damn.* No. 231; *Harv. Man.* 1st edit. p. 123.

Hab.—On submarine rocks between tide-marks. Annual. Summer. Torquay (*Rev. J. M. Berkeley*); Tor Abbey Rocks (*Mrs. Wyatt*); rocks at Kilkee, Co. Clare 1833, Miltown Malbay and Valentia, Kerry (*Dr. Harvey*).

Geogr. Dist.—South of England and West of Ireland.

Description.—Fronds somewhat convex or subhemispherical, spreading, from one to two inches in diameter, from a quarter to half an inch in thickness, roundish when young and more or less smooth, more irregular when old, and the fronds frequently confluent. Structure cellular, cells of the central portion oblong, cylindrical, arranged in the form of dichotomous hyaline filaments; those of the middle stratum forming dichotomous, moniliform, coloured filaments, those of the periphery deeply coloured, tufted, moniliform; all densely packed, forming a solid frond at all stages of its growth. Substance rather firm and cartilaginous, and partially adhering to paper. Colour, a dark olive brown.

Of this singular little plant we have only seen dried specimens, kindly communicated by Professor Dickie and others.

It is said to be abundant at least in several places on the south-western shores both of England and Ireland, but we have not heard of its occurrence on those of Scotland. It is possibly confined to those places whose vegetation seems influenced by the temperature of the Gulf stream, and where many others of our rarer species of Algæ have been observed.

Although scarcely so complicated in its structure as the preceding, its regularly located filaments form a beautiful object under the microscope, the cells being only of two distinct forms; those of which the central filaments are composed being cylindrical, those of the periphery spherical.

In habit, too, it is much more crustaceous than the preceding, being closely appressed to the rock, to which it is firmly attached by its whole under surface, and never, so far as we have been able to learn, found parasitical.

LEATHESIA BERKELEYI.

EXPLANATION OF DISSECTIONS.

Fig. 1.—Section of frond.
2.—Filaments of same. Both magnified.

RALFSIA VERRUCOSA.—*Aresch.*

Gen. Char.—Frond subcoriaceous, appressed, and attached by its whole under surface; cells arranged in densely-packed vertical filaments. Fructification: slightly convex warts produced on the upper surface, and formed of vertical filaments, to the bases of which are attached obovate spores. Name "in honour of John Ralfs, Esq., of Penzance, a most acute and accurate botanist, whose discoveries among the minute Algæ, especially the *Diatomaceæ*, have thrown great light on that little known branch of botany."—*Phyc. Brit.*

Ralfsia *verrucosa.*—Frond forming a thick, somewhat leathery crust on the surface of the rock, to which it is closely appressed and adherent.

Ralfsia *verrucosa.*—*Aresch. Linn.* (1843) p. 264; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 62; *Harv. Man.* p. 49; *Harv. Syn.* p. 43; *Atlas*, plate 15, fig. 60.

Ralfsia *deusta.*—*Berk.* in *Eng. Bot.* Suppl. t. 2866; *Harv. P. B.* plate 98.

Hildenbrandtia *rubra.*—*Endl.* 3rd Suppl. p. 26 (nec *Syn. Berk.*; nec *Menegh.*).

Cruoria *verrucosa.*—*Aresch.*

Padina (?) *deusta.*—*Hook. Br. Fl.* vol. ii. p. 281; *Harv.* in *Mack. Fl. Hib.* part 3, p. 178; *Harv. Man.* 1st edit. p. 31.

Zonaria (?) *deusta.*—*Ag. Syn.* p. 40; *Ag. Sp. Alg.* vol. i. p. 132; *Ag. Syst.* p. 265; *Lyngb. Hyd. Dan.* p. 19, t. 5.

Fucus *fungularis.*—*Oeder, Fl. Norv.* vol. ii. p. 107; *Fl. Dan.* t. 420 (excl. syn. *Imperati.*).

Hab.—Common between high-water mark, and half-tide level. Perennial. Winter.

Geogr. Dist.—Atlantic shores of Europe, from Iceland to France; Baltic Sea (*Aresch.*); Kamtschatka and Unalascha (*Tilesius*).

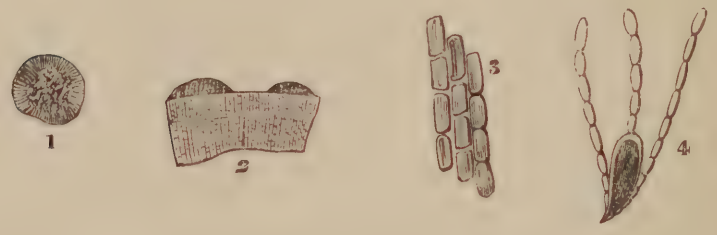
Description.—Fronds slightly convex, spreading in concentric rings over the surface of the rock, in patches of one, two, or more inches in extent, circular when young, but becoming irregular in outline, and often confluent when old, marked more or less distinctly, especially when young, with concentric growth lines, which become obsolete in age, when they are often succeeded by numerous wrinkles spreading over the surface, which thus becomes very rugged when old. The structure is very dense, the cells oblong, arranged in vertical, simple, filamentous series, densely packed together in firm gelatine. Fructification: obovate spores, attached by short pedicels, at the base of vertical, club-shaped, jointed filaments, which are closely compacted into depressed sub-hemispherical tubercles scattered over the surface of the frond. Substance

subcoriaceous, scarcely adhering to paper. Colour, a dark olivaceous umber brown.

This curious plant is by no means unfrequent on most of our shores, and is particularly abundant and luxuriant on the west coast, spreading over the surface of rocks, often to a considerable extent; the fronds frequently more or less confluent and irregular, and often arising into rough corrugated excrescences by compression, not unlike in appearance some of the subfoliaceous lichens, but of a dark brown colour, and possessing a very different structure from that of any lichen.

In external form, this bears a close resemblance to *Peisonellia*, *Hildenbrandtia*, and *Cruoria*, and to the two former even in structure, but the colour and the structure of the spores are very different.

It is perhaps one of the least beautiful or attractive of the Algæ, either externally or microscopically; a thin slice, however, of the tubercles composing the fructification is an object of considerable interest, especially when contrasted with the rugged and amorphous appearance of the plant which produces it.



RALFSIA VERRUCOSA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Ralfsia verrucosa*, natural size.
2.—Vertical section of same.
3.—Cells or filaments of the frond.
4.—Filaments of the tubercles and spore. All magnified.

ELACHISTA FUCICOLA.—*Fries.*

Gen. Char.—Fronds consisting of a more or less evident tubercular base, composed of ovate cells, arranged in the form of mostly dichotomous filaments, densely packed, terminating in free, simple filaments, forming a brush-like tuft. Fructification: obovate spores, produced at the base of the simple filaments, and often accompanied by tufts of short, clavate "*paranemata.*" Name from ἐλάχιστα, "the least," in allusion to the small size of the species.

Elachista *fucicola.*—Free filaments elongate, much attenuated upwards; articulations once or twice as long as broad; tubercle hemispherical.

Elachista *fucicola.*—*Fries, Fl. Scan.* p. 317; *Aresch. Pug.* t. 8, f. 6, 7; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 12; *Harv. P. B.* plate 240; *Harv. Man.* p. 49; *Harv. Syn.* p. 43; *Atlas,* plate 15, fig. 61; *Harv. N. B. A.* part 1, p. 131.

Myrionema *fucicolum.*—*Endl.* 3rd Suppl. p. 23.

Phycophila *fucorum,* and *P. Agardhii.*—*Kütz. Phyc. Gen.* p. 330.

Conferva *fucicola.*—*Velley, Pl. Mar.* No. 4; *Dillw. Conf.* t. 66; *Lyngb. Hyd. Dan.* t. 50; *Ag. Syst.* p. 103; *Harv.* in. *Hook. Br. Fl.* vol. ii. p. 354; *Harv.* in *Mack. Fl. Hib.* part 3, p. 227; *Harv. Man.* 1st edit. p. 131; *Wyatt, Alg. Danm.* No. 192.

Conferva *ferruginea.*—*Ag. Syst.* p. 103.

Hab.—Parasitical on the genus "*Fucus,*" more particularly "*serratus.*" Annual. Summer and autumn. Very common.

Geogr. Dist.—Atlantic shores of Northern Europe; Baltic Sea.

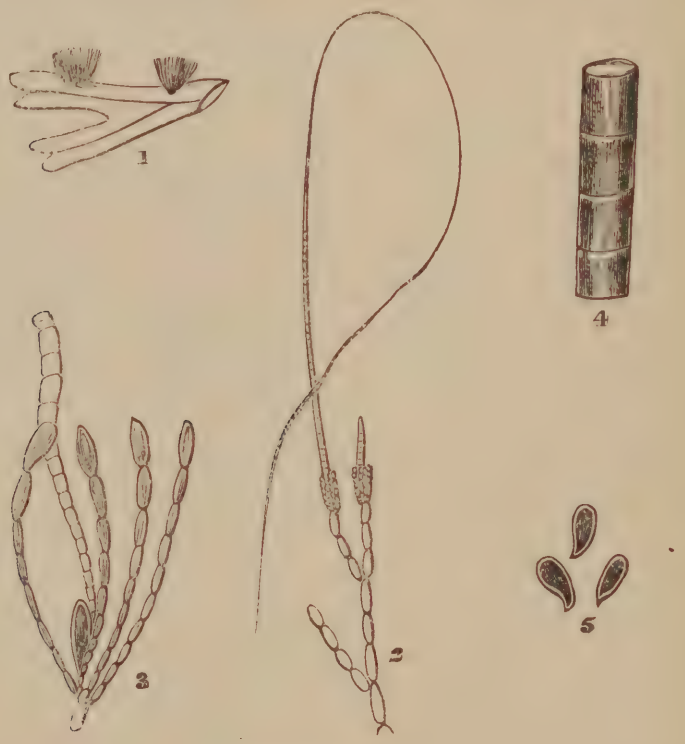
Description. — Tubercle hemispherical, at first minute, partially immersed in the substance of the plant on which it grows, gradually enlarging in size, and composed of radiating filaments, three to five times dichotomous, and formed of roundish elliptical cells, closely compacted together into a hard subcartilaginous tubercle; each of the ultimate divisions is crowned with a tuft of from three to four short, simple, articulated, club-shaped filaments (*paranemata*) forming the periphery of the frond, and a long, slender, articulated filament, much attenuated upwards, and slightly so at the base. Articulations about one and a-half times as long as their diameter; these constitute the brush-like tuft, and are from half an inch to an inch in length. Substance cartilagineo-membranaceous, slightly adhering to the paper. Colour, a dull brownish or greyish olive.

One of the largest and commonest species of the genus, and one of the most common of our northern Algæ, found in profusion wherever *Fucus*

serratus and *vesiculosus* abound ; these plants it peculiarly affects, but is also occasionally observed on *F. nodosus*, and perhaps on other allied species. It forms very conspicuous brush-like tufts on the plants which it infests, often in such abundance as to give it quite a shaggy looking aspect.

The tubercle is said to originate under the surface of the plant, and is by some considered the most essential part of the frond, as containing the fructification ; the long, slender filaments that form the brush-like portion, and the most conspicuous part, being considered as merely accessory. Both, however, appear to have much the same structure, and to be similarly coloured. The elongated filaments, although not perhaps absolutely essential to the fructification, are very different from the colourless hyaline filaments so common on the marine Algæ.

The large size of the present species, the repeatedly dichotomous filaments of the tubercle, and the long, slender, attenuated filaments of the brush, will readily distinguish this from the other species of the genus.



ELACHISTA FUCICOLA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Elachista fucicola*, on *Fucus vesiculosus*, natural size.
2.—Filaments.
3.—Apical filaments (paranemata).
4.—Portion of a filament.
5.—Spores. All magnified.

ELACHISTA FLACCIDA.—*Aresch.*

Gen. Char.—Fronds consisting of a more or less evident tubercular base, composed of ovate cells, arranged in the form of mostly dichotomous filaments, densely packed, terminating in free, simple filaments, forming a brush-like tuft. Fructification: obovate spores, produced at the base of the simple filaments, and often accompanied by tufts of short, clavate "*paranemata.*" Name from ἐλάχιστα, "the least," in allusion to the small size of the species.

Elachista *flaccida.*—Filaments flaccid, much elongated, and attenuated at the base; apices attenuated to an obtuse point; lower articulations scarcely half as long as broad, upper rather longer than broad; tubercle minute.

Elachista *flaccida.—Aresch. Pug.* 2, p. 262; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 11; *Harv. P. B.* plate 260; *Harv. Man.* p. 50; *Harv. Syn.* p. 44; *Atlas,* plate 15, fig. 62; *Fries, Fl. Scan.* p. 317; *Eng. Bot.* t. 2912.

Elachista *breviarticulata.—Aresch.* in *Linn.* vol. xvi. p. 234, t. 8, f. 5.

Phycophila *flaccida.—Kütz. Phyc. Gen.* p. 330.

Myrionema *breviarticulatum.—Endl.* 3rd Suppl. p. 23.

Conferva *flaccida.—Dillw.* t. G.; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 355; *Harv.* in *Mack. Fl. Hib.* part 3, p. 227; *Harv. Man.* 1st edit. p. 132; *Wyatt, Alg. Danm.* No. 292.

Conferva *obtusa.—Ag. Syst.* p. 101.

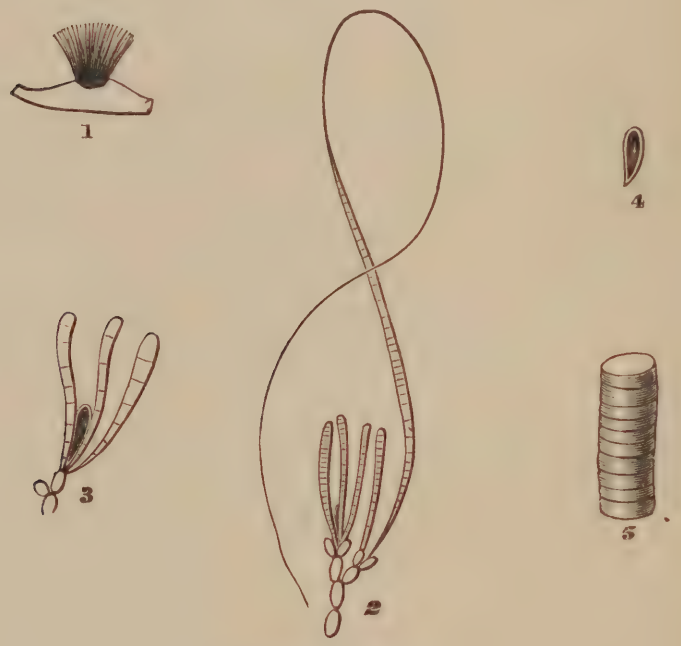
Conferva *breviarticulata.—Suhr,* in *Flora* 1831, p. 32, t. 4, f. 36, *x, y, z.*

Hab.—Parasitical on *Cystoseira fibrosa.* Common. Annual. Summer and autumn.

Geogr. Dist.—Atlantic shores of France and England.

Description.—Tubercle very minute, its filaments closely compacted, formed of ovate or obovate cells, once or twice dichotomous; each of the ultimate divisions crowned with a tuft of club-shaped *paranemata,* composed of ovato-oblong cells, which gradually increase in size to the apices. Among these nestle the spores, which are obovate, with very short stalks; the brush-like filaments are elongate, shortly and very much attenuated at the base, cylindrical for a little above the middle, then slightly tapering to the apex, which is very obtuse. The lower articulations scarcely so long as broad, the upper gradually longer, those near the apex somewhat longer than broad, slightly swollen in the middle. Substance very flaccid, and closely adhering to the paper in drying. Colour, a pale greenish olive.

This neat little species seems partial to *Cystoseira fibrosa*, on which it is by no means uncommon. In habit it closely resembles *E. fucicola*, but from that species it may be readily distinguished by its smaller tufts, the attenuated bases of the filaments, their obtuse apices, and their short articulations, especially at the base. It is a plant of no great beauty, either externally or internally, but should not therefore be despised, as it no doubt forms a link in the chain of creation; and although its importance is unknown, or but little understood, it has no doubt important functions to perform in the grand economy of the ocean world—functions which, if left unfulfilled, it is difficult to say how great a blank would be produced in the harmony of ocean-being; if but one link, however small and unimportant, is wanting in the continuity of the chain, its integrity, its strength is gone.



ELACHISTA FLACCIDA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Elachista flaccida*, tuft on *Cystoseira fibrosa*, natural size.
2.—Filaments.
3.—Paranemata and spore.
4.—A spore.
5.—Portion of a filament. All magnified.

ELACHISTA CURTA.—*Aresch.*

Gen. Char.—Fronds consisting of a more or less evident tubercular base, composed of ovate cells, arranged in the form of mostly dichotomous filaments, densely packed, terminating in free, simple filaments, forming a brush-like tuft. Fructification: obovate spores, produced at the base of the simple filaments, and often accompanied by tufts of short clavate "*paranemata.*" Name from ἐλάχιστα, "the least," in allusion to the small size of the species.

Elachista *curta.* — "Filaments very short, tapering to the base, obtuse, pencilled, rather rigid, rising from a tubercle; articulations about as long as broad; spores pyriform, on long pedicels; paranemata linear-clavate."—*Phyc. Brit.*

Elachista *curta.*—*Aresch.* in *Linn.* vol. xvi. p. 234; *Harv. P. B.* plate 332; *Harv. Man.* p. 50; *Harv. Syn.* p. 44; *Atlas*, plate 15, fig. 63; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 12.

Conferva *curta.*—*Dillw.* t. 76; *Ag. Syst.* p. 103; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 355; *Harv. Man.* 1st edit. p. 132.

Hab.—On *Fuci*, between tide-marks. Annual. Summer. At Swansea (*Mr. L. W. Dillwyn*). (Not found since his time).

Geogr. Dist. —— ?

Description. — Tubercle very minute. Paranemata linear-filiform; the apices clavate. Articulations cylindrical, three to four times as long as broad; filaments short from a slender tapering base, somewhat clavate, slightly tapering to the apex, which is rather obtuse and rounded; their articulations about as long as broad, slightly contracted at the dissepiments, those at the base cylindrical, three to four times as long as broad. Spores pyriform or obovate, gradually tapering into rather long, slender pedicels.

We are chiefly indebted to *Phyc. Brit.* for our descriptions of this species, never having met with it, and we are there informed that it has not been recently met with, although Dillwyn says that it is not uncommon at Swansea. Possibly its small size and family-likeness may have caused it to be overlooked, as no doubt many of the obscure and less conspicuous of the Algæ have often been. We are informed in the splendid work of Dr. Harvey, that the only specimens he had seen were some very poor ones preserved in the herbarium of Sir W. Jackson Hooker.

May not this so-called species be some battered stumps of some other of the genus? A species said to be common in Dillwyn's time can scarcely, one would think, have entirely disappeared.

ELACHISTA CURTA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Elachista curta*, natural size.
2.—"Paranemata" and filaments.
3.—Same with a spore.
4.—Portion of a filament. All magnified.
(Reduced from *Phyc. Brit.*)

ELACHISTA STELLULATA.—*Griff.*

GEN. CHAR.—Fronds consisting of a more or less evident tubercular base, composed of ovate cells, arranged in the form of mostly dichotomous filaments, densely packed, terminating in free, simple filaments, forming a brush-like tuft. Fructification: obovate spores, produced at the base of the simple filaments, and often accompanied by tufts of short, clavate "*paranemata.*" Name from ἐλάχιστα, "the least," in allusion to the small size of the species.

ELACHISTA *stellulata.*—"Tufts very minute, stellate; tubercle composed of large cells; filaments short, tapering to the base, linear, club-shaped, obtuse; articulations about twice as long as broad, uniform; paranemata with short articulations."—*Phyc. Brit.*

ELACHISTA *stellulata.*—*Griff. MSS.*; *Aresch. Pug.* in *Linn.* vol. xvii. p. 261, t. 9, f. 4; *Harv. P. B.* plate 261; *Harv. Man.* p. 51; *Harv. Syn.* p. 45; *Atlas*, plate 15, fig. 64.

MYRIONEMA *stellulatum.*—*J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 49.

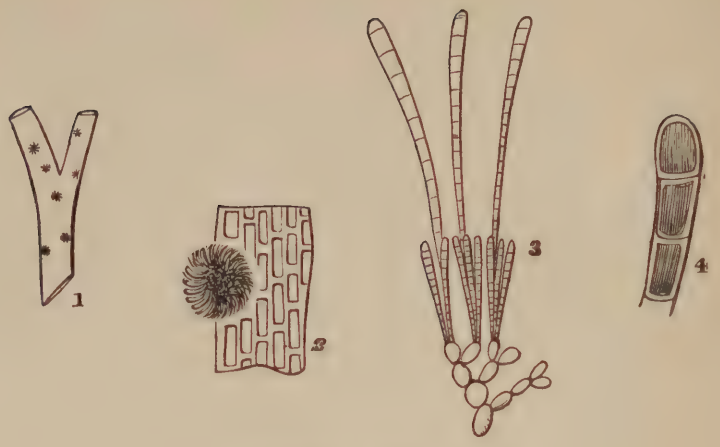
CONFERVA *stellulata.*—*Harv. Man.* 1st edit. p. 132.

HAB.—Parasitical on *Dictyota dichotoma.* Annual. Summer. Torquay (*Mrs. Griffiths*).

GEOGR. DIST.—Not observed out of England.

DESCRIPTION.—Tufts excessively minute, scarcely apparent to the naked eye, or only appearing as minute dots. Tubercle rather large in proportion to the minute size of the plant; its cells very large, roundish oval, once or twice dichotomous, the ultimate divisions crowned with a tuft of clavate paranemata, with very short joints; filaments from a slender base, gradually thickening upwards, the apices very obtuse. The articulations rather longer than their diameters, scarcely contracted at the dissepiments. Spores we have not seen. "They are figured by Dr. Areschoug as obovate oblong."—*Phyc. Brit.*

With this we are but imperfectly acquainted. Our specimens were collected by the late Mrs. Griffiths, but are very poor, and we have not been able to obtain recent ones. It is said to be "not uncommon about Torquay," but we are not aware of its recent occurrence. It grows on the fronds of *Dictyota dichotoma*, and may possibly be found on other species of that family, such as *Cutleria*, *Padina* or *Punctaria*, and should be looked for on these plants when they have reached maturity.



ELACHISTA STELLULATA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Elachista stellulata*, tufts on *Dictyota dichotoma*, natural size.
2.—Same.
3.—Paranemata and filaments.
4.—Portion of the latter. All magnified.

ELACHISTA SCUTULATA.—*Duby.*

Gen. Char.—Fronds consisting of a more or less evident tubercular base, composed of ovate cells arranged in the form of mostly dichotomous filaments, densely packed, terminating in free, simple filaments, forming a brush-like tuft. Fructification: obovate spores, produced at the base of the simple filaments, and often accompanied by tufts of short, clavate "*paranemata.*" Name from ἐλάχιστα, "the least," in allusion to the small size of the species.

Elachista *scutulata.*— Tubercle roundish oblong, rather large, composed of densely packed, dichotomously branched filaments, consisting of oblong, subcylindrical cells, contracted at the dissepiment; filaments rather short, their articulations cylindrical, about two and a half times as long as broad.

Elachista *scutulata.*—*Duby, Bot. Gall.* vol. ii. p. 972; *Harv. P. B.* plate 333; *Harv. Man.* p. 50; *Harv. Syn.* p. 45; *Atlas,* plate 16, fig. 65; *Kütz. Syst. Alg.* p. 540; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 11.

Conferva *scutulata.*—*Eng. Bot.* t. 2311; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 355; *Harv.* in *Mack. Fl. Hib.* part 3, p. 227; *Harv. Man.* 1st edit. p. 132; *Wyatt, Alg. Danm.* No. 223.

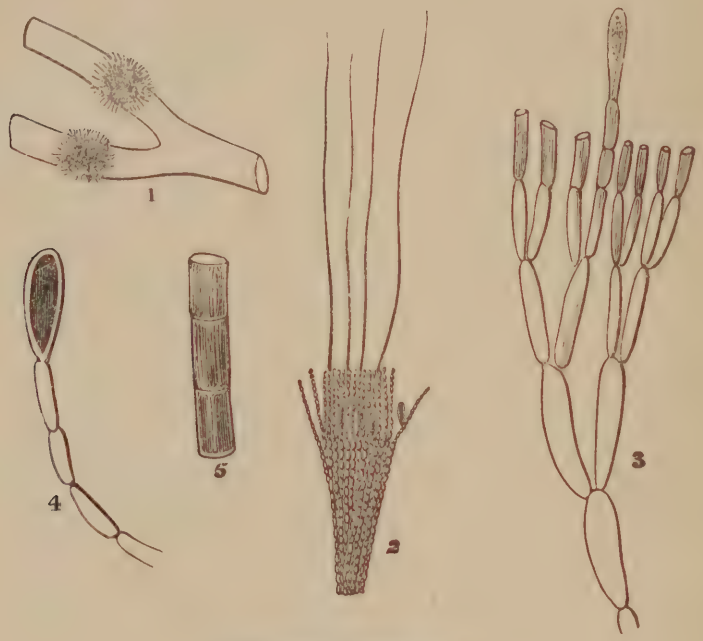
Hab.—Parasitical on *Himanthalia lorea.* Annual. Summer and autumn. Common.

Geogr. Dist.—Shores of Europe.

Description. — Tubercle rather large, oblong oval, and frequently entirely surrounding the stem on which it grows, extending for the distance of an inch or more over the surface, and having a thickness of from three to four lines, composed of filaments whose cells are oblong, three to four times longer than their diameter, often obliquely constricted at the dissepiments, hyaline, the ultimate divisions tipped with tufts of few, short, cylindrical filaments (*paranemata*), accompanied by long, slender, cylindrical filaments, with obtuse apices, their cells cylindrical, not constricted at the dissepiments, two to three times as long as broad. Fructification: obovato-oblong spores, which, with their pedicel, are about two-thirds of the length of the paranemata. The filaments and paranemata are generally abraded from the older or central portion of the patch or tubercle, the younger part near the margin being only in general furnished with them. Substance cartilagineo-membranaceous, externally soft and lubricous, and adhering closely to paper.

This very pretty species is almost as common as the plant to which its

habitat is restricted, and not unfrequently covering whole thongs of that species with its little shield or sheath-like fronds; at first resembling little dots, tipped with the slender filaments, which gradually increase in size until they frequently entirely surround the thong. The tubercle is very compact and firm, but the surface is lubricous and slippery, which enables it to adhere closely to paper.



ELACHISTA SCUTULATA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Elachista scutulata*, tufts of, on *Himanthalia lorea*, natural size.
2.—Section of part of a tuft.
3.—Filaments from same.
4.—Spore with its pedicel.
5.—Joints from the elongated filaments. All magnified.

ELACHISTA PULVINATA.—*Kütz.*

Gen. Char.—Fronds consisting of a more or less evident tubercular base, composed of ovate cells, arranged in the form of mostly dichotomous filaments, densely packed, terminating in free, simple filaments, forming a brush-like tuft. Fructification: obovate spores, produced at the base of the simple filaments, and often accompanied by tufts of short, clavate "*paranemata.*" Name from ἐλάχιστα, "the least," in allusion to the small size of the species.

Elachista *pulvinata.*—"Tufts very minute, globose, filaments fusiform, much attenuated at both ends, the basal joints three to four times, the middle once and a half, the apical about as long as broad; spores linear-obovate, subsessile at the base of the filaments."

Elachista *pulvinata.*—*Kütz.* in *Bot. Zeit.* (1847) p. 144; *Harv. Man.* p. 50; *Harv. Syn.* p. 46; *Atlas*, plate 16, fig. 66.

Elachista *attenuata.*—*Harv. P. B.* plate 28 A; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 9.

Hab.—Parasitical on *Cystoseira ericoides.*—Annual. Summer and autumn. South of England and west of Ireland. Perhaps not uncommon.

Geogr. Dist.—South of England and west of Ireland; Mediterranean Sea.

Description.—Fronds minute, the tubercle deeply immersed in the structure of the plant on which it grows, very compact, the filaments nearly simple, formed of oval joints; the filaments few, spindle-shaped, slender at the base, and somewhat acute at the apex, the middle joints about as long as broad, contracted at the dissepiments. Lower articulations subcylindrical, three to four times as long as broad, those at the apex moniliform. Spores obovato-oblong, surrounded by a wide pellucid limbus. Substance subcartilaginous, soft and lubricous on the surface.

We are only acquainted with this species in the dry state, not having been fortunate enough to see it in its native haunts, although it is said not to be unfrequent in the south and south-west of England and Ireland, wherever the *Cystoseira ericoides* abounds; forming minute globose tufts, scattered over the plant. The fusiform filaments readily distinguish it from any of the other British species.

ELACHISTA PULVINATA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Elachista pulvinata*, tufts on *Cystoseira*, natural size.
2.—Same.
3.—Section of a tuft.
4.—Portion of same.
5.—Spore and part of an elongated filament. All magnified.
(Reduced from *Phyc. Brit.*)

ELACHISTA VELUTINA.—*Fries.*

Gen. Char.—Fronds consisting of a more or less evident tubercular base, composed of ovate cells arranged in the form of mostly dichotomous filaments, densely packed, terminating in free, simple filaments, forming a brush-like tuft. Fructification: obovate spores, produced at the base of the simple filaments, and often accompanied by tufts of short, clavate "*paranemata.*" Name from ἐλάχιστα, "the least," in allusion to the small size of the species.

Elachista *velutina.*—"Spreading in their indefinite velvety patches; filaments very minute, equal in diameter throughout, dissepiments slightly contracted; joints once to one and a half times as long as broad; spores elliptical, pedicellate, affixed to the lower part of the filaments."—*Phyc. Brit.*

Elachista *velutina.*—*Fries, Flor. Scan.* p. 317; *Aresch.* in *Linn.* vol. xvi. p. 235, t. 8, f. 9; *Harv. P. B.* plate 28 B.; *Harv. Man.* p. 51; *Harv. Syn.* p. 46; *Atlas*, plate 16, fig. 67; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 10.

Myrionema *velutinum.*—*Endl.* 3rd Suppl. p. 23.

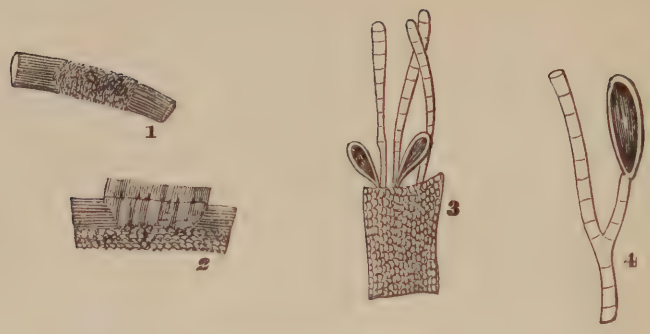
Sphacelaria (?) *velutina.*—*Grev. Crypt. Fl.* t. 350; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 325; *Harv.* in *Mack. Fl. Hib.* part 3, p. 181; *Harv. Man.* 1st edit. p. 39.

Hab.—Parasitical on *Himanthalia lorea* and *Fucus serratus.* Common.

Geogr. Dist.—Atlantic coasts of Europe.

Description.—"Forming dark olive velvety patches of indefinite extent on the surface of the Fuci affected, rooting in their substance. Filaments about a line in height, linear, obtuse, coloured, except at the very base, simple or occasionally forked at a joint or two above the base. Articulations once or twice as long as broad, slightly contracted at the dissepiments. Spores elliptical or oblong, or somewhat obovate, dark olive, with a wide limbus, supported on slender pedicels, which are evidently contracted filaments."—*Phyc. Brit.*

Although this species is said to be not uncommon, we have not been able to procure specimens. It is found on the thongs of *Himanthalia lorea*, and very much resembles in appearance *E. scutulata*, with which it is sometimes associated, but from which it may generally be distinguished by its less convex patches, more diffused in their habit, and by the darker colour and more distinctly obovate spores, and their shorter pedicels.



ELACHISTA VELUTINA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Elachista velutina*, patch, natural size.
2.—Section of same.
3.—Portion of same.
4.—Filament and spore. All magnified.
(Reduced from *Phyc. Brit.*)

MYRIONEMA STRANGULANS.—*Grev.*

Gen. Char.—Fronds formed of two strata of articulated filaments: 1, forming a thin stratum, creeping and cohering; 2, erect, simple. Fructification, consisting of obovate spores, attached either to the erect or creeping filaments. Name from μυρίος, "a myriad," and νήμα, "a thread," in allusion to the multitude of minute filaments of which the plants are composed.

Myrionema *strangulans*.—Fronds somewhat convex, spreading, often confluent, dark brown; filaments clavate, closely compacted; spores roundish obovate, pedicellate, attached to the creeping filaments.

Myrionema *strangulans*.—*Grev. Crypt. Fl.* t. 300; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 48; *Kütz. Sp. Alg.* p. 540; *Harv.* in *Mack. Fl. Hib.* part 3, p. 223; *Harv. P. B.* plate 280; *Harv. Man.* p. 51; *Harv. Syn.* p. 47; *Atlas*, plate 16, fig. 68; *Harv. N. B. A.* part 1, p. 132.

Hab.—Parasitical on the fronds of various *Ulvæ* and *Enteromorphæ*. Annual. Summer and autumn. Very common.

Geogr. Dist.—Not correctly known; likely to be widely dispersed.

Description. — Plants formed of numerous decumbent filaments closely appressed to the surface of the plants on which they grow, forming a very thin stratum of simple articulated filaments, closely adhering together; cells short, angular; from these arise short, erect, simple, somewhat club-shaped filaments, obtuse and rounded at the apices; the cells about as long as broad, or towards the apex rather longer than broad. Fructification: obovate or pyriform spores, attached to the creeping filaments by short one or two-jointed pedicels, about one-third the height of the erect filaments. Substance subcartilaginous, scarcely adhering to paper. Colour, dark brownish olive.

This curious parasite is by no means uncommon on all our coasts, but is very uncertain in its appearance. When it does occur, it generally completely covers the patch or even the pool where it fixes its habitat.

It generally occurs on some of the green Algæ, such as *Ulva*, *Enteromorpha*, or *Conferva*, appearing in the form of minute, dark brown, almost black spots, at first consisting of the creeping filaments only, which spread over the surface of the plant, in the filiform species often entirely investing it, and at length emitting from every joint of the creeping filaments, which form a thin membranous base, the erect filaments, when the surface becomes somewhat convex and lubricous.

Eventually, the patches frequently become confluent, and much darker in colour. The spores are large compared with the size of the plant, and are not uncommon; when these are abundant the plant forms a beautiful object for the microscope.

MYRIONEMA STRANGULANS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Myrionema strangulans*, on *Enteromorpha Linkiana*, natural size.
2.—Same.
3.—Section of same.
4.—Filaments and spores. All magnified.

MYRIONEMA LECHLANCHERII.—*Grev.*

Gen. Char.—Fronds formed of two strata of articulated filaments: 1, forming a thin stratum, creeping and cohering; 2, erect, simple. Fructification, consisting of obovate spores, attached either to the erect or creeping filaments. Name from *μυρίος*, "a myriad," and *νήμα*, "a thread," in allusion to the multitude of minute filaments of which the plants are composed.

Myrionema *Lechlancherii.*—Patches determinate, roundish, filaments dense towards the middle, few towards the edges; spores on long pedicels, attached to the creeping filaments.

Myrionema *Lechlancherii.*—*Harv. P. B.* plate 41 A.; *Harv. Man.* p. 51; *Harv. Syn.* p. 47; *Atlas*, plate 16, fig. 69; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 48.

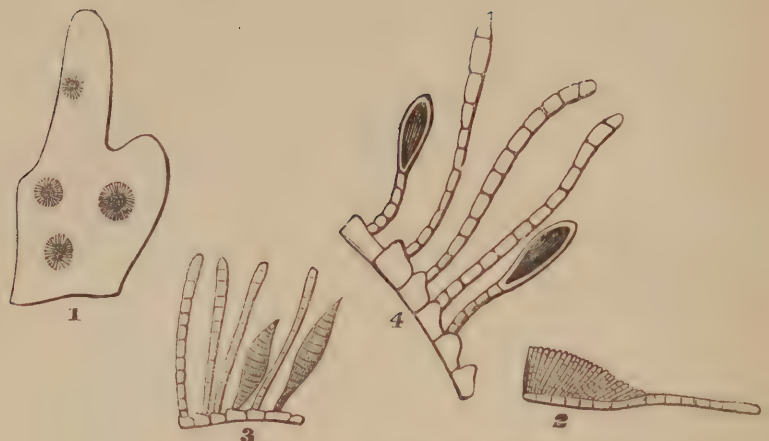
Rivularia *Lechlancherii, Chauv.*—See *Lenorm.* in *Litt.*

Hab.—On decaying fronds of *Rhodymenia palmata.* Not uncommon. Annual. Autumn.

Geogr. Dist.—Shores of Europe.

Description.—Patches at first minute, flat, spreading in the form of a thin stratum of creeping filaments, with few erect filaments, which at length become numerous, closely compacted, forming a slightly convex button, surrounded with a thin flat margin; filaments cylindrical, scarcely clavate; the articulations about as long as broad, slightly contracted at the dissepiments. Spores obovate, attached to the creeping filaments, or rather terminal on abbreviated filaments, from one-third to one-half as long as the primary ones. More frequently, however, the filaments are converted into fusiform bodies, which may be abortive spores, or in some other way connected with the fructification. Substance subcartilaginous. Colour, greenish olive, brownish when old.

This curious and minute parasite is rather frequent on the fronds of the common dulse, as they pass into decay during the autumn, and are so minute that they are scarcely observable to the naked eye, except by the discoloration; looking, as Professor Harvey remarks, more like incipient decay than a distinct organism, their curious structure only becoming apparent when placed under the microscope.



MYRIONEMA LECHLANCHERII.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Myrionema Lechlancherii*, on *Rhodymenia palmata*, natural size.
2.—Section of same.
3.—Filament from same.
4.—Filaments and spores. All magnified.
(Reduced from *Phyc. Brit.*)

MYRIONEMA PUNCTIFORME.—*Harv.*

Gen. Char.—Fronds formed of two strata of articulated filaments: 1, forming a thin stratum, creeping and cohering; 2, erect, simple. Fructification, consisting of obovate spores, attached either to the erect or creeping filaments. Name from *μυρίος*, "a myriad," and *νῆμα*, "a thread," in allusion to the multitude of minute filaments of which the plants are composed.

Myrionema *punctiforme.*—"Patches globose, filaments tapering to the base; spores linear-obovate, affixed to the vertical filaments near their base."—*Phyc. Brit.*

Myrionema *punctiforme.*—*Harv.* in *Hook. Br. Fl.* vol. ii. p. 391; *Harv. P. B.* plate 41 B.; *Harv. Man.* p. 51; *Harv. Syn.* p. 47; *Atlas*, plate 16, fig. 70; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 49.

Linkia *punctiformis.*—*Lyngb. Hyd. Dan.* t. 66; *Carm. Alg. App.* ined. cum icone.

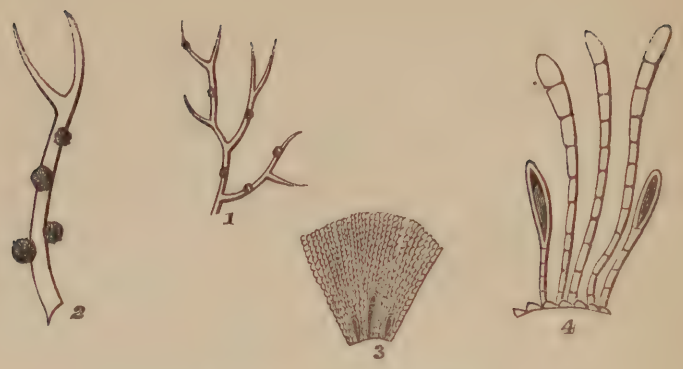
Hab.—Parasitical on the *Florideæ.* Annual. Summer and autumn. On *Chrysimenia clavellosa* at Appin (*Capt. Carmichael*); on *Ceramium rubrum* at Torquay (*Mrs. Griffiths*).

Geogr. Dist.—Shores of Europe.

Description.—"Fronds or patches very minute, half a line or less in diameter, flattish or globose, composed of vertical threads, radiating from a small base; filaments slightly tapering to the base, with joints twice or thrice as long as broad. Spores sessile, near the bases of the erect filaments, very narrow in proportion to their length."—*Phyc. Brit.*

This pretty little species was first discovered in this country by the late Captain Carmichael, on the coast of Appin, and subsequently by Mrs. Griffiths, to both of whom we are much indebted for their numerous discoveries among the minute species of marine Algæ.

The present species Dr. Harvey considers as not likely to be uncommon, but from its minute size it may very possibly have often escaped detection. We have not seen the species, and are indebted to Professor Harvey for our knowledge of the characters.



MYRIONEMA PUNCTIFORME.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Myrionema punctiforme*, on *C. rubrum*, natural size.
2.—Same.
3.—Semisection of same.
4.—Filaments. All magnified.
(Reduced from *Phyc. Brit.*)

MYRIONEMA CLAVATUM.—*Harv.*

GEN. CHAR.—Fronds formed of two strata of articulated filaments: 1, forming a thin stratum, creeping and cohering; 2, erect, simple. Fructification, consisting of obovate spores, attached either to the erect or creeping filaments. Name from *μυρίος*, "a myriad," and *νῆμα*, "a thread," in allusion to the multitude of minute filaments of which the plants are composed.

MYRIONEMA *clavatum.* — "Very minute, rather convex; filaments clavate, mostly bifid; spores obovate, pedicellate, affixed to the filaments."—*Phyc. Brit.*

MYRIONEMA *clavatum.*—*Harv.* in *Hook. Br. Fl.* vol. ii. p. 391; *Harv. P. B.* plate 348; *Harv. Man.* p. 51; *Harv. Syn.* p. 48; *Atlas*, plate 18, fig. 75; *Kütz. Sp. Alg.* p. 540; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 50.

LINKIA *clavata.*—*Carm. Alg. App.* ined. cum ic.

HAB.—On a thin purple cartilaginous crust, probably a *Verrucaria*, which covers the pebbles at half-tide level. Autumn. Appin (*Capt. Carmichael*), who adds, "The parasite is so much of the colour of the crust, it requires a microscope to detect it." (*Phyc. Brit.*)

GEOGR. DIST. —— ?

Of this pretty little parasite we know nothing except what is given in *Phyc. Brit.*, and in *Hooker's Brit. Fl.*, on the authority of Captain Carmichael, who alone seems to have observed the plant; and we are not aware if specimens of it exist in any herbarium, nor are we informed of the nature of the crust on which it was found.

MYRIONEMA CLAVATUM.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Myrionema clavatum*, on a quartz pebble, natural size.
2.—Filaments, magnified.
3.—The same, more magnified.

Plate CLXIX.

CLADOSTEPHUS VERTICILLATUS.—*Ag.*

Gen. Char.—Fronds cartilaginous, not jointed; ramuli jointed, whorled, short, nearly simple. Fructification: "elliptical utricles," borne on "accessary ramuli," produced on the old fronds. Name from κλάδος, "a branch," and στέφος, "a crown."

Cladostephus *verticillatus.* — Whorls rather distant, ramuli much incurved, with one or two spine-like ramelli on the outer edge near the apex.

Cladostephus *verticillatus.*—*Ag. Syn. Int.* p. 25; *Lyngb. Hyd. Dan.* p. 102, t. 30; *Hook. Fl. Scot.* vol. ii. p. 89; *Grev. Fl. Edin.* p. 312; *Wyatt, Alg. Danm.* No. 82; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 322; *Harv.* in *Mack. Fl. Hib.* part 3, p. 179; *Harv. P. B.* plate 33; *Harv. Man.* p. 54; *Harv. Syn.* p. 48; *Atlas,* plate 14, fig. 58; *Harv. N. B. A.* part 1, p. 135; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 43.

Cladostephus *myriophyllum.*—*Ag. Syst.* p. 169; *Ag. Sp. Alg.* vol. ii. p. 10; *Endl.* 3rd Suppl. p. 24; *Kütz. Phyc. Gen.* p. 294, t. 18, f. 1; *J. Ag. Alg. Medit.* p. 30.

Ceramium *verticillatum.*—*D.C. Fl. Fr.* vol. ii. p. 39; *Ducluz. Ess.* p. 49.

Conferva *verticillata.*—*Lightf. Fl. Scot.* p. 984 (1777); *Huds. Fl. Angl.* p. 653; *With. Br. Pl.* vol. iv. p. 133; *Dillw. Conf.* t. 55; *E. Bot.* t. 1718 and 2427, f. 2; *Roth, Cat. Bot.* vol. iii. p. 309.

Conferva *myriophyllum.*—*Roth, Cat. Bot.* vol. iii. p. 312, t. 12, f. *b.* (1806).

Conferva *ceratophyllum.*—*Roth,* l. c. p. 311.

Fucus *verticillatus.*—*Wulf. Crypt.* No. 15, t. 1.

Hab.—On rocks, stones, &c., within tide marks. Perennial, fruiting in winter. Very common.

Geogr. Dist.—Atlantic and Mediterranean shores of Europe, abundantly; Cape Frio, Brazil (*Tilesius*).

Description.— Root, a minute disc. Frond from a slender base, filiform, cylindrical, much branched; branches mostly dichotomous, sometimes trichotomous, erecto-patent, slightly incurved, inarticulate, everywhere covered with whorls of short, articulated, incurved ramuli, from a slender base gradually thickening to a little beyond the middle, then tapering to a rather acute point, much incurved; with one or two rigid, conical, spine-like ramelli, projecting from the outer edge near the apex. Articulations about as long as broad, the surface striated longitudinally,

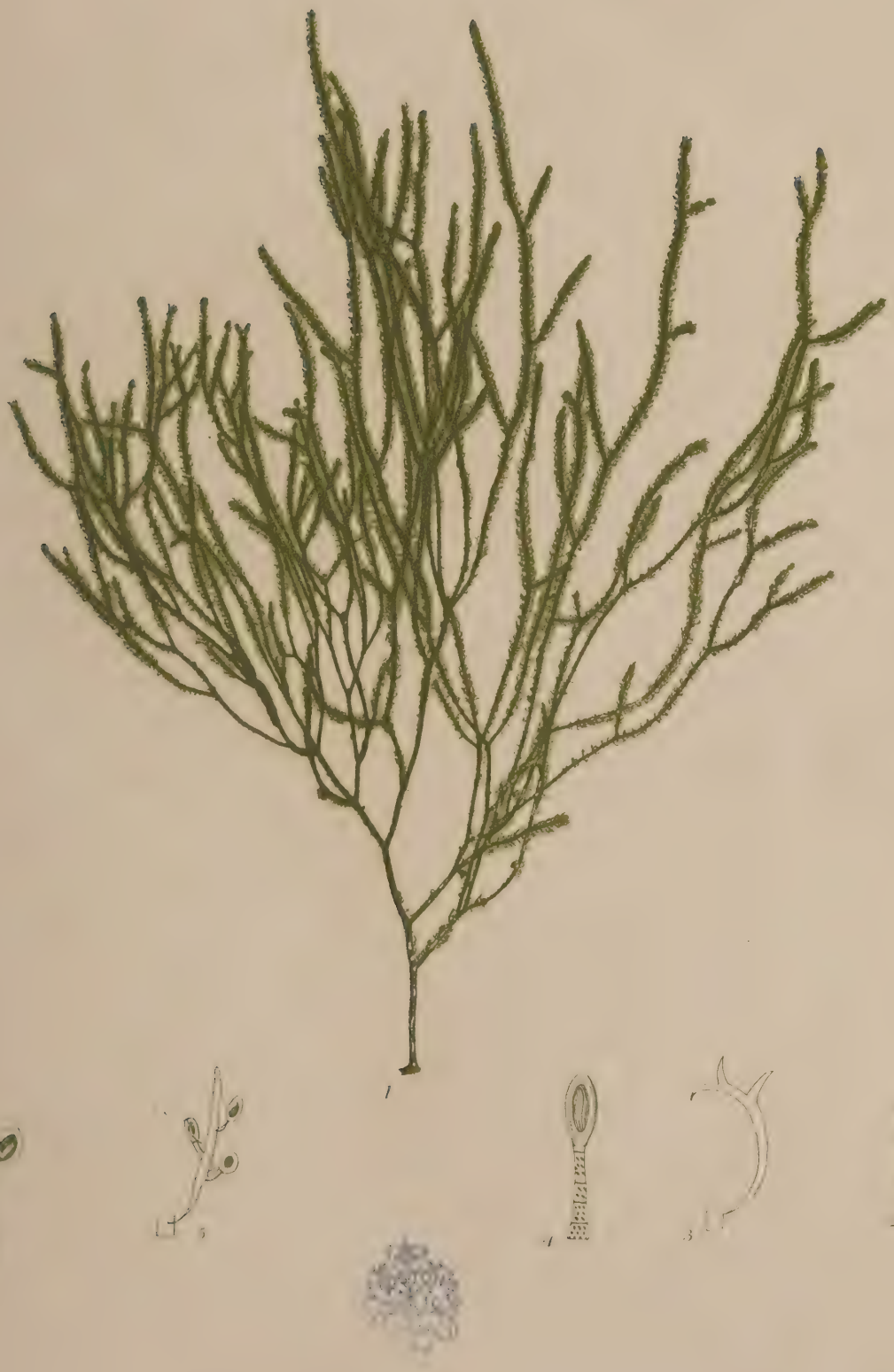
and reticulated with the small quadrate cells. In winter these ramelli mostly disappear, becoming abraded, and the naked fronds become covered with scattered, cylindrical or somewhat fusiform ramuli, which bear the "utricles" on little stalks arising from their sides; they are broadly elliptical, surrounded with a pellucid limbus. "The apices of the summer ramuli are frequently distended and sphacelate, and contain a dark mass, which may be possibly also connected with reproduction." —*Phyc. Brit.* Substance cartilaginous, not adhering to paper. Colour dark brownish olive.

A very distinct plant in the family to which it belongs; common on the British shore, but apparently more so in the south than the north.

The fructification above described is considered by Professor Harvey and other British botanists as the true fruit, whereas he informs us that Italian botanists consider this as a parasite. The structure, however, of its ramuli, and of the fruit itself, is so similar to that of the plant, and, as Professor Harvey observes, is so exactly what, from analogy, we should expect on the plant, that we can see no good reason for considering it other than the fruit of the *Cladostephus*. The sphacelate apices of the ramuli, mentioned in *Phyc. Brit.*, we have not observed, but as the structure of the ramuli is not very widely different from that of *Sphacelaria*, in which this character is sometimes largely developed, it is nothing wonderful if it should occur in the present genus, whether it be or be not connected with the fructification.

EXPLANATION OF PLATE CLXIX.

Fig. 1.—*Cladostephus verticillatus*, natural size.
2.—Portion of a branch.
3.—A ramulus.
4.—Sphacelate apex of a ramulus.
5.—Accessary fruiting ramulus.
6.—Utricle in situ. All magnified.



Cladostephus verticillatus. fig.

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Plate CLXX.

CLADOSTEPHUS SPONGIOSUS.—*Ag.*

Gen. Char.—Fronds cartilaginous, not jointed; ramuli jointed, whorled, short, nearly simple. Fructification: "elliptical utricles," borne on "accessary ramuli," produced on the old fronds. Name from κλάδος, "a branch," and στέφος, "a crown."

Cladostephus *spongiosus.*—Branches short, ramuli mostly simple, not regularly whorled, and densely imbricated.

Cladostephus *spongiosus.*—*Ag. Syst.* p. 168; *Ag. Sp. Alg.* vol. ii. p. 12; *Wyatt, Alg. Danm.* No. 169; *J. Ag. Alg. Medit.* p. 30; *Endl.* 3rd Suppl. p. 24; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 322; *Harv.* in *Mack. Fl. Hib.* part 3, p. 180; *Harv. P. B.* plate 138; *Harv. Man.* p. 54; *Harv. Syn.* p. 48; *Atlas*, plate 17, fig. 71; *Harv. N. B. A.* part 1, p. 135; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 43.

Cladostephus *laxus.*—*Fl. Dan.* t. 1955, f. 3 (?) excl. syn.

Conferva *spongiosa.*—*Huds. Fl. Angl.* p. 596; *Lightf. Fl. Scot.* p. 983; *With. Br. Pl.* vol. iv. p. 132; *Dillw. Conf.* t. 42; *E. Bot.* t. 2427, fig. 1.

Fucus *hirsutus.*—*Linn. Mant.* p. 134; *Esper*, t. 28.

Hab.—On rocks and stones in the sea, between tide marks, and to the depth of eight fathoms. Perennial. Winter. Common.

Geogr. Dist.—Atlantic shores of Europe and North America; Mediterranean Sea Cape Horn (*Dr. Hooker*).

Description.—Root, a minute disc. Fronds filiform, cylindrical, much branched from near the base, three to five inches in length, and (without the ramuli) hardly a quarter of a line in thickness, slightly attenuated at the base; branches mostly dichotomous, erecto-patent, slightly incurved, everywhere beset with irregularly whorled, articulated, slightly incurved, mostly simple ramuli, closely imbricated and rather erect, attenuated to the base, and gradually thickening upwards to a little above the middle, then attenuated to a rather acute point, generally simple, but occasionally with a single, straight, acuminated spine projecting from the outside near the apex. Articulations about as long, or scarcely so long as their diameter; surface slightly, longitudinally striated; cells minute. In winter these ramelli are abraded, and their place is occupied by others which are less curved, more cylindrical, and very obtuse, and which bear the fructification—roundish elliptical, stalked "utricles"—on their sides in abundance. Substance firm, cartilaginous, not adhering to the paper in drying. Colour, a dark brownish olive.

This species is extremely common on most of our shores, delighting in low, flat, mud-covered rocks, about half-tide level, where it often forms extensive colonies, growing most frequently singly, but occasionally several from the same root.

The branching is generally dichotomous, but sometimes, when a branch becomes wounded or injured, numerous branches spring from the wounded part, giving the whole plant a very dense and matted appearance.

This species is chiefly distinguished from the preceding by its more dwarfish fronds, their less regular and more closely approximated whorls, the ramuli being so much imbricated that the whorls are not distinctly apparent ; they are also mostly simple, or with only a single spine on the outer edge.

The present is a much more matted, clumsy, and less elegant species than the preceding, and is generally so filled with mud and sand among its branches or ramuli, that it is no easy matter to get them removed, and the plant rendered clean for preserving.

EXPLANATION OF PLATE CLXX.

Fig. 1.—*Cladostephus spongiosus*, natural size.
2.—Portion of stem with scattered ramuli.
3.—Portion of stem with sporiferous ramulus.
4.—Apex of ramulus.
5.—Semisection of stem. All magnified.

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Cladostephus spongiosus. fig.

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Plate CLXXI.

SPHACELARIA FILICINA.—*Ag.*

Gen. Char.—Fronds filiform, articulated, dichotomously branched; apices of the branches generally more or less distended, as if the apical cell was enlarged and inflated, containing in its centre a dark granular mass of endochrome. Fructification: "elliptical utricles (or spores), furnished with a limbus, borne on the ramuli." Name from σφάκελος, "a gangrene," in allusion to the withered, diseased-like apices of the branches, very characteristic in some of the species.

Sphacelaria *filicina*. — Frond filiform, slender, clothed at the base with slender bushy fibres, irregularly pinnate; pinnæ again pinnate or bipinnate, erecto-patent; pinnulæ erect, all alternate.

Sphacelaria *filicina*.—*Ag. Syst.* p. 166; *Ag. Sp. Alg.* vol. ii. p. 22; *Mont. Crypt. Alg.* No. 24; *Menegh. Alg. Ital. et Dalm.* p. 324; *J. Ag. Alg. Medit.* p. 30; *Endl.* 3rd Suppl. p. 23; *Mont. Fl. Alg.* p. 41; *Wyatt, Alg. Danm.* No. 170; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 323; *Harv. P. B.* plate 142; *Harv. Man.* p. 55; *Harv. Syn.* p. 49; *Atlas* plate 17, fig. 72; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 38.

Sphacelaria *hypnoides*.—*Grev. Scot. Crypt. Fl.* t. 348.

Sphacelaria *simpliciuscula*.—*Ag. Sp. Alg.* vol. ii. p. 31.

Halopteris *filicina*.—*Kütz. Phyc. Gen.* p. 292.

Ceramium *filicinum*.—*Gratel. Journ. Med.* vol. iv. p. 33.

Hab.—On rocks and nullipores near low-water mark, and at the roots of *Laminariæ*, &c. Rare. Perennial. Fruiting in winter. Several places in the south of England; Jersey; Belfast Bay (*Mr. W. Thompson*); Youghal (*Miss Ball*); Kinsale Harbour (*Dr. Harvey*).

Geogr. Dist.—Atlantic shores of France and Spain; Mediterranean Sea.

Description. — Frond having the lower part covered with shaggy fibres, irregularly pinnate; pinnæ often fasciculate, again bipinnate or even tripinnate, pinnules erecto-patent, the middle ones longest, giving the divisions a lanceolate or oblong-lanceolate outline; frequently the outline is broken by a branch becoming more elongated than the rest, whilst the main stems and branches are often partially denuded of their pinnæ, and are more or less naked. Pinnæ and pinnulæ alternate, one arising from every third or fourth articulation; ultimate pinnules generally more erect, subulate, slightly incurved. Articulations about half as long as broad, longitudinally striate, especially when old. Fructification produced on the young pinnules while yet simple, a single obovate spore forming in the axil of the pinnule. Structure consisting of

four large central cells, surrounded by longitudinal series of smaller ones. Substance very rigid, not adhering to paper. Colour, a greenish-olive.

One of our rarest and prettiest species, and one which seems to find its northern limit on our southern shores, where it is even rare. It is said to grow to a much greater size on the shores of southern Europe, where it is much more common. We are not aware of any Scotch locality or any in the north of England.

It is said to have been found in fructification in Jersey by Miss Turner, but we have seen no fruit.

Like most perennial Algæ, its summer and winter habits are widely different; in winter the beautiful fern-like fronds becoming denuded of their pinnules, so that it looks quite like a different species. This Agardh appears to describe as a different species, under the name of *S. simpliciuscula*; while Dr. Greville considered the British as different from that found in the south of Europe, and has given it under the name of *S. hypnoides*, as noticed in *Phyc. Brit.*

EXPLANATION OF PLATE CLXXI.

Fig. 1.—*Sphacelaria filicina*, natural size.
2.—Portion of stem of pinna and pinnule.
3.—Joints of same.
4.—Transverse section of stem. All magnified.

Sphacelaria filicina. Ag.

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SPHACELARIA SERTULARIA.—*Bonnem.*

Gen. Char.—Fronds filiform, articulated, dichotomously branched; apices of the branches generally more or less distended, as if the apical cell was enlarged and inflated, containing in its centre a dark granular mass of endochrome. Fructification: "elliptical utricles (or spores), furnished with a limbus, borne on the ramuli." Name from σφάκελος, "a gangrene," in allusion to the withered, diseased-like apices of the branches, very characteristic in some of the species.

Sphacelaria *sertularia*. — "Frond slightly shaggy at the base, weak and slender, irregularly branched; branches somewhat lanceolate or linear, horizontally patent, tripinnate, pinnæ alternate, divaricate, pinnules very patent, multifid; axils all very obtuse and wide."—*Phyc. Brit.*

Sphacelaria *sertularia*.—*Bonnem.* sec. *Lenorm.* in *Herb.*; *Harv. P. B.* plate 143; *Harv. Man.* p. 55; *Harv. Syn.* p. 49; *Atlas*, plate 18, fig. 76; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 35.

Sphacelaria *filicina*, β *patens*.—*Harv. Man.* 1st edit. p. 37.

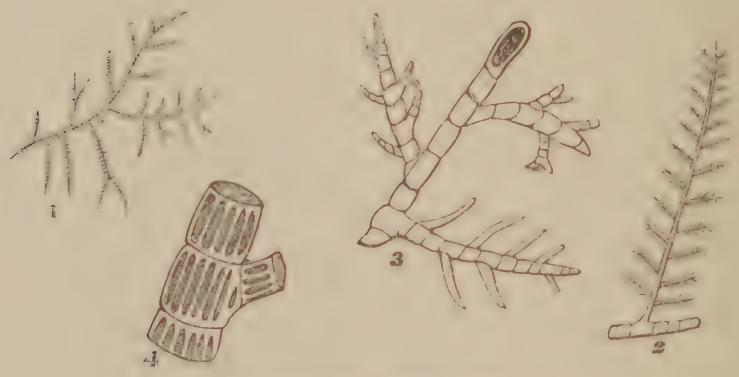
Hab.—Parasitical on various Algæ, in three to twenty fathoms water. Rare. Perennial. Brighton (*Mr. Borrer*); Torbay (*Mrs. Griffiths*); Isle of Wight (*Miss Kirkpatrick*); Jersey (*Miss White, Mr. F. P. Girdlestone*); Carrickfergus (*Mr. M'Calla*); Roundstone Bay (*Dr. Harvey*).

Geogr. Dist.—Atlantic shores of France; south of England and Ireland.

Description.—Fronds very slender, about an inch or an inch and a half in length, much tufted and matted together, interwoven with other filiform Algæ, irregularly pinnate; pinnæ of very irregular length, sometimes bare of such below, at other times pinnate to the base; at one time the middle pinnæ are longest, at another those at the ends, or several series of long and short pinnæ alternate; pinnæ again pinnate or bipinnate, each series shorter, all very patent or even recurved, ultimate pinnules somewhat erect, the apices obtuse. Pinnæ and pinnulæ mostly alternate, but frequently irregular or defective, sometimes all are secund; the two lower pinnules on each pinna often on the same side, the others generally arising from each joint alternately; the pinnæ from each alternate joint. Articulations about as long as broad, longitudinally striated, siphons four; "the ultimate ramuli monosiphonous." Substance rather rigid, not adhering to paper. Colour, a rather pale olive green. The apices of the pinnules are more frequently sphacelate than those of the last species. The fructification we have not seen.

This species may generally be known from the last by its more slender and straggling habit, and somewhat less regular branching; the branches are very patent or even recurved, the ultimate ones scarcely erect, yet it certainly approaches very near the last species, and may be only a deep water variety of that variable plant, which puts on various habits according to situation, season, and other circumstances. Our specimens were dredged in Belfast Lough, and were kindly communicated by Dr. Dickie; they are without fruit, which we have not seen.

It is said to be always found in deep water, and generally grows entangled among other small Algæ, which may in some measure account for the difference in habit.



SPHACELARIA SERTULARIA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Sphacelaria sertularia*, natural size.
2.—Pinna.
3.—Apex of pinna.
4.—Joints of the stem. All magnified.

Plate CLXXII.

SPHACELARIA SCOPARIA.—*Lyngb.*

Gen. Char.—Fronds filiform, articulated, dichotomously branched; apices of the branches generally more or less distended, as if the apical cell was enlarged and inflated, containing in its centre a dark granular mass of endochrome. Fructification: "elliptical utricles (or spores) furnished with a limbus, borne on the ramuli." Name from σφάκελος, "a gangrene," in allusion to the withered, diseased-like apices of the branches, very characteristic in some of the species.

Sphacelaria *scoparia.*—Frond rather stout, densely covered in the lower part with matted fibres, much and irregularly branched; branches alternately pinnate or bipinnate, pinnulæ slender, spine-like.

Sphacelaria *scoparia.*—*Lyngb. Hyd. Dan.* p. 104, t. 31 B.; *Ag. Syst.* p. 167; *Ag. Syst. Alg.* vol. ii. p. 19; *Grev. Fl. Edin.* p. 313; *Wyatt, Alg. Danm.* No. 361; *Ag. Alg. Medit.* p. 29; *Endl.* 3rd Suppl. p. 23; *Menegh. Alg. Ital. et Dalm.* p. 344; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 323; *Harv.* in *Mack. Fl. Hib.* part 3, p. 180; *Harv. P. B.* plate 37; *Harv. Man.* p. 55; *Harv. Syn.* p. 50; *Atlas*, plate 17, fig. 73; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 36.

Sphacelaria *disticha.*—*Lyngb.* l. c. p. 104, t. 31 A.; *Ag. Sp. Alg.* vol. ii. p. 26; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 323.

Sphacelaria *scoparioides.*—*Lyngb.* l. c. p. 107, t. 32 C.; *Ag. Syst.* p. 165.

Ceramium *scoparium.*—*Roth, Cat. Bot.* vol. iii. p. 141; *Hook. Fl. Scot.* part 2, p. 86.

Conferva *scoparia.*—*Linn. Syst. Nat.* vol. ii. p. 270; *Huds. Fl. Angl.* p. 595; *Lightf. Fl. Scot.* p. 981; *With. Br. Pl.* vol. iv. p. 131; *Dillw. Conf.* t. 52; *E. Bot.* t. 1552.

Conferva *marina pennata.*—*Dillen*, t. 4, f. 23.

Stypopodium *scoparium.*—*Kütz. Phyc. Gen.* p. 293, t. 18, f. 2.

Hab.—On rocks in the sea. Not uncommon all round our coasts.

Geogr. Dist.—Atlantic coasts of Europe from Norway to Spain; Baltic and Mediterranean Seas; Canary Islands (*Webb*); Cape of Good Hope (*Dr. Harvey*).

Description.—Root, a rather large, flat disc, which, as well as the stem, especially towards the base, is covered with a dense coating of matted fibres. Stem rather stout and rigid, much branched irregularly, often fascicled, especially in old specimens; branches pinnate or bipinnate, pinnæ and pinnulæ erecto-patent, arising alternately from each joint or from each alternate joint; ultimate pinnulæ slender, tapering to a point, spine-like. Articulations in the older parts about half as long as

broad, in the younger about as long as broad. The structure internally is composed of minute quadrate cellules, externally the surface is slightly striated. Fronds two to five inches long, rigid, scarcely adhering to the paper in drying. Colour, dark olive green.

A most variable species, exhibiting in its summer, autumn, and winter states as great a diversity of ramification as is to be found almost in any other Algæ ; so great, that more than one species has been contended for by some of the Continental botanists, but Dr. Harvey has come to a different, and, we think, a more accurate conclusion. In sea-weeds, more than in the land plants, is careful, patient, and continued observation necessary, in order to arrive at anything like a just idea of the limits of species : so variable are the influences to which they are exposed, from the ever-changing medium in which they grow, that nothing but a most rigid and careful study of specimens, collected under every possible circumstance, and over a wide area, can justify us in deciding the claims to specific distinction in the case of such polymorphous species.

The present species is by no means of uncommon occurrence in the south, but seems to become scarce as we proceed northwards.

It is a larger, much harsher, and more bushy plant than the preceding, with the pinnules more spine-like, and may be readily known by the different structure of the stem.

EXPLANATION OF PLATE CLXXII.

Fig. 1.—*Sphacelaria scoparia*, natural size.
2.—Pinna.
3.—Portion of young stem.
4.—Portion of old stem.
5.—Portion of young stem. All magnified.

SPHACELARIA scoparia. LYNGB

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Plate CLXXIII.

SPHACELARIA PLUMOSA.—*Lyngb.*

Gen. Char.—Fronds filiform, articulated, dichotomously branched; apices of the branches generally more or less distended, as if the apical cell was enlarged and inflated, containing in its centre a dark granular mass of endochrome. Fructification: "elliptical utricles (or spores) furnished with a limbus, borne on the ramuli." Name from σφάκελος, "a gangrene," in allusion to the withered, diseased-like apices of the branches, very characteristic in some of the species.

Sphacelaria *plumosa.*—Fronds slender; stems not jointed, much and irregularly branched, especially upwards; branches pectinato-pinnate, with very long, slender, opposite pinnæ from each joint.

Sphacelaria *plumosa.*—*Lyngb. Fl. Dan.* p. 103, t. 30; *Ag. Syst.* p. 166; *Ag. Sp. Alg.* vol. ii. p. 24; *Grev. Fl. Edin.* p. 313; *Wyatt, Alg. Danm.* No. 300; *Endl.* 3rd Suppl. p. 23; *Harv.* in *Hook. Brit. Fl.* vol. ii. p. 324; *Harv.* in *Mack. Fl. Hib.* part 3, p. 180; *Harv. P. B.* plate 87; *Harv. Man.* p. 56; *Harv. Syn.* p. 50; *Atlas*, plate 17, fig. 73.

Chætopteris *plumosus.*—*Kütz. Phyc. Gen.* p. 293; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 41.

Ceramium *pennatum.*—*Fl. Dan.* t. 1481; *Roth, Cat. Bot.* vol. iii. p. 133; *Ag. Syn.* p. 68.

Conferva *pennata.*—*E. Bot.* t. 2330 (left-hand figure).

Hab.—On rocks and stones near low-water mark to four and five fathoms. Perennial. Not uncommon.

Geogr. Dist.—German Ocean, along the shores of Denmark and Norway; Baltic Sea; Greenland (*Fabricius*).

Description.—Root, a minute disc. Fronds much tufted, rather slender, two to four inches or more in length, irregularly branched, especially upwards, the base of the stem, as well as the branches, being naked for a short distance. Branches generally distant, but sometimes, towards the summit, more or less fascicled, especially when the plant has been broken or injured. All the branches very closely pectinate throughout; the pinnæ generally longest near the apex, often very short at the base, giving the branch an oblong-lanceolate, or linear-lanceolate appearance in the outline, opposite, arising from every joint, or when again pinnate, as they occasionally are in their upper half, only from every other joint, when they are less closely pectinate. Articulations scarcely so long as broad, making the pinnæ very close, in which they

are rather longer than broad ; articulations obsolete in the main stems, which are cellular, firm, and rigid, scarcely adhering to paper. Colour, a brownish olive.

This fine species, perhaps the finest of the genus—one, by the way, which is not very remarkable for the beauty of its forms—is said to become more common in the northern than on the southern shores; but our specimens are all from the south of England, although its occurrence on the shores of Scotland is said to be not rare.

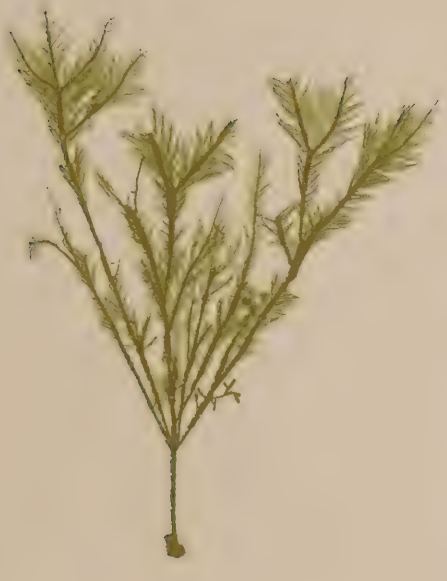
It may be readily known from its congeners by its closely pectinated stems, and long, slender, generally simple but rigid pinnæ, standing out like minute wires from the branches. The finest specimens are generally found beneath low-water mark, which seems to be its favourite habitat, although it is occasionally met with in rock-pools between tides.

The fructification of the *Sphacelariæ* is but imperfectly understood, and that of the present species, among several others, appears to be unknown.

The apices of the branches are said to be often fasciculate, but in our specimens they are very imperfectly so.

EXPLANATION OF PLATE CLXXIII.

Fig. 1.—*Sphacelaria plumosa*, natural size.
2.—Portion of a plumule.
3.—Portion of a pinnule.
4.—Section of an old stem.
5.—Semisection of an old stem. All magnified.



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Sphacelaria plumosa. Lyngb.

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SPHACELARIA CIRRHOSA.—*Ag.*

Gen. Char.—Fronds filiform, articulated, dichotomously branched; apices of the branches generally more or less distended, as if the apical cell was enlarged and inflated, containing in its centre a dark granular mass of endochrome. Fructification: "elliptical utricles (or spores) furnished with a limbus, borne on the ramuli." Name from σφάκελος, "a gangrene," in allusion to the withered, diseased-like apices of the branches, very characteristic in some of the species.

Sphacelaria *cirrhosa*.—Fronds forming brush-like tufts, simple or much branched; branches mostly alternate, frequently opposite or irregular; fruit globose.

Sphacelaria *cirrhosa*.—*Ag. Syst. Alg.* p. 164; *Ag. Sp.* vol. ii. p. 27; *Wyatt, Alg. Damn.* No. 171; *J. Ag. Alg. Medit.* p. 29; *Endl.* 3rd Suppl. p. 24; *Grev. Crypt. Fl.* p. 317; *Kütz. Phyc. Gen.* p. 292; *Harv.* in *Mack. Fl. Hib.* part 3, p. 180; *Harv. P. B.* plate 178; *Harv. Man.* p. 56; *Harv. Syn.* p. 51; *Atlas*, plate 18, fig. 77; *Harv. N. B. A.* part 1, p. 137; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 34.

Sphacelaria *pennata*.—*Lyngb. Hyd. Dan.* p. 105, t. 31 (excl. var. β.)

Ceramium *cirrhosum*.—*Hook. Fl. Scot.* part 2, p. 86.

Conferva *marina perbrevis villosa et cirrhosa*.—*Dill. Musc.* t. 4, f. 21.

Conferva *cirrhosa*.—*Roth, Cat.* vol. ii. p. 214; vol. iii. p. 294.

Conferva *intertexta*.—*Roth, Cat. Bot.* vol. i. p. 188, t. 3, f. 5.

Conferva *pennata*.—*Huds.* p. 604; *Dillw.* t. 86; *E. Bot.* t. 2330 (right-hand figure); *Fl. Dan.* t. 1486, f. 2.

Hab.—Parasitical on the smaller Algæ, between tide-marks. Perennial. Summer. Common.

Geogr. Dist.—Abundant on the Atlantic and Mediterranean shores of Europe.

Description.—Fronds forming stellate tufts, parasitical, from half an inch to an inch in length, simple or at length more or less regularly pinnate, bipinnate or even tripinnate, alternate, opposite or irregular, very closely placed, and arising from every second joint, or alternate or irregular and distant; ultimate pinnules mostly simple, slender, but very irregular in length, the longest ones often with scattered pinnules. Outline of the pinnæ generally oblong acute, a few of the uppermost pinnules gradually shorter. Stem and branches articulated throughout. Articulations about as long as their diameter, longitudinally striate; apices generally sphacelate, spores globose, sessile on the pinnulæ, or with short stalks. Substance firm, and scarcely adhering to the paper. Colour, a brownish or greenish olive, when dry.

A small species, but from its abundance generally a conspicuous object in every tide-pool, and, like most common objects, exceedingly variable in its characters, so that some botanists, in an attempt to simplify their descriptions and render them more precise, have raised these varieties to the rank of species.

We have no hesitation, however, in considering all the varieties we have seen as only forms of one polymorphous species, and indeed, many of them may be observed on the same tuft, and passing by imperceptible degrees into each other.

It seems to have a predilection for *Fucus vesiculosus*, but we are unable to say whether its range is equivalent. Where plentiful, however, it grows almost on anything within its domain, such as *F. serratus*, *Halidrys siliquosa*, &c., &c.

From *S. plumosa* it may generally be distinguished by its articulated stems, less regularly pectinate and very unequal pinnæ. Sessile and stalked fruit may generally be observed on the same plant, and for the most part those utricles that are produced near the base of the ramulus have longer stalks than those towards the apex.

SPHACELARIA CIRRHOSA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Sphacelaria cirrhosa*, tufts, natural size.
2.—Pinna with fruit.
3.—Portion of same. Both magnified.

SPHACELARIA FUSCA.—*Ag.*

Gen. Char.—Fronds filiform, articulated, dichotomously branched; apices of the branches generally more or less distended, as if the apical cell was enlarged and inflated, containing in its centre a dark granular mass of endochrome. Fructification: "elliptical utricles (or spores) furnished with a limbus, borne on the ramuli." Name from σφάκελος, "a gangrene," in allusion to the withered diseased-like apices of the branches, very characteristic in some of the species.

Sphacelaria *fusca.*—"Filaments densely tufted, capillary, distinctly and irregularly branched; branches long and simple, bearing a few clavate or three-forked minute ramuli; articulations twice as long as broad, marked by a transverse band; spores globose."—*Phyc. Brit.*

Sphacelaria *fusca.*—*Ag. Sp. Alg.* vol. ii. p. 34; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 324; *Harv. P. B.* plate 149; *Harv. Man.* p. 57; *Harv. Syn.* p. 51; *Atlas*, plate 18, fig. 78; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 32.

Conferva *fusca.*—*Huds. Fl. Angl.* p. 602; *With. Br. Pl.* vol. iv. p. 141; *Dillw. Conf.* t. 95.

Hab.—On rocks and stones, between tide-marks. Very rare. Anglesea (*Rev. H. Davies*); Newton Nottage, Glamorgan (*Mr. W. W. Young*); Worms Head and other places in Gower (*Mr. Dillwyn*); Sidmouth (*Mrs. Griffiths*); St. Michael's Mount, Cornwall (*Mr. Ralfs.*)

Geogr. Dist.—Shores of Wales and south of England?

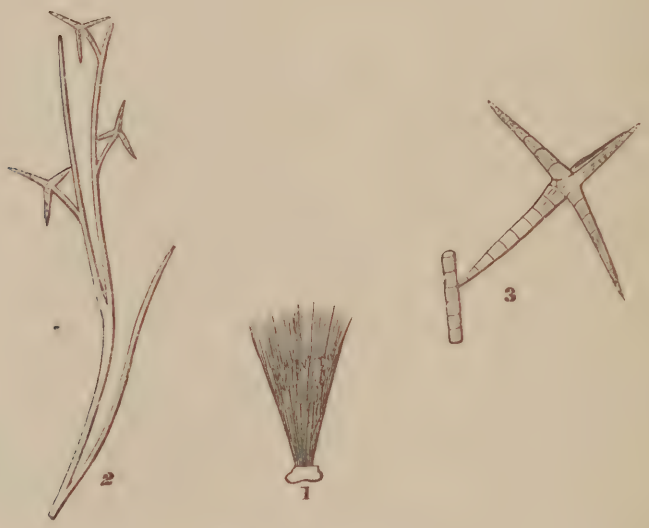
Description.—Fronds much tufted, one to two inches long, very slender, and but slightly branched; branches suberect, long, slender, simple, filiform, cylindrical, with here and there a short, cylindrical, clavate ramulus, with frequently three spine-like, spreading, or recurved ramelli near the apex. Articulations about twice as long as broad or nearly, with a dark band across the middle of each. The branches are sometimes regularly dichotomous, sometimes subalternate, and occasionally partly secund. Substance rather firm, and but slightly adhering to paper. Colour brownish olive.

This plant we have never met with, and have only seen a very imperfect specimen "from Devonshire." Professor Harvey says, "that it would seem to be pretty common on the coast of Wales," but its small size and obscure habit may cause it to be often overlooked.

Its irregular branching and rather longer joints will readily distinguish it from the preceding, and when the curious ramelli are well

developed, they form such a striking feature in its character, that there can be no mistaking it. The banded articulations too are quite peculiar.

It should be carefully looked for in tide-pools, as it is likely to occur in many more places than those in which it has yet been found, and besides, it is very probable that there may be other species in this obscure family still to reward the labour of the attentive explorer, as the history of the family is still very imperfect, and only a few leading facts are known of their history.



SPHACELARIA FUSCA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Sphacelaria fusca*, tuft, natural size.
2.—Branch.
3.—Ramulus. Both magnified.
(Reduced from *Phyc. Brit.*)

SPHACELARIA RADICANS.—*Harv.*

Gen. Char.—Fronds filiform, articulated, dichotomously branched; apices of the branches generally more or less distended, as if the apical cell was enlarged and inflated, containing in its centre a dark granular mass of endochrome. Fructification: "elliptical utricles (or spores) furnished with a limbus, borne on the ramuli." Name from *σφάκελος*, "a gangrene," in allusion to the withered, diseased-like apices of the branches, very characteristic in some of the species.

Sphacelaria *radicans*.—"Filaments erect or decumbent, sending out a few fibrous radicles from the lower part, sparingly branched; branches alternate, simple, very erect, straight, and bare of ramuli; utricles clustered, sessile, globose."—*Phyc. Brit.*

Sphacelaria *radicans*.—*Harv.* in *Hook. Br. Fl.* vol. ii. p. 324; *Harv.* in *Mack. Fl. Hib.* part 3, p. 181; *Harv. P. B.* plate 189; *Harv. Man.* p. 57; *Harv. Syn.* p. 52; *Atlas*, plate 18, fig. 79; *Harv. N. B. A.* part 1, p. 37; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 137; *Wyatt, Alg. Danm.* No. 210.

Sphacelaria *cirrhosa*, ζ *simplex*.—*Ag. Sp. Alg.* vol. ii. p. 29.

Sphacelaria *olivacea*.—*Ag. Sp. Alg.* vol. ii. p. 30; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 324; *Harv.* in *Mack. Fl. Hib.* part 3, p. 181; *Harv. Man.* 1st edit. p. 39; *Kütz. Phyc. Gen.* p. 292; *Endl.* 3rd Suppl. p. 24.

Conferva *radicans*.—*Dillw.* Suppl. p. 57, t. C.; *E. Bot.* 2138.

Conferva *olivacea*.—*Dillw.* Suppl. p. 57, t. C.; *E. Bot.* 2172; *Hook. Fl. Scot.* part 2, p. 83.

Hab.—On shelving rocks, between tide-marks. Perennial. Autumn. Not uncommon. At intervals from Lands' End to Orkney; Irish coasts.

Geogr. Dist.—Iceland, Baltic, Heligoland (*Binder*); coast of France (*Chauvin*).

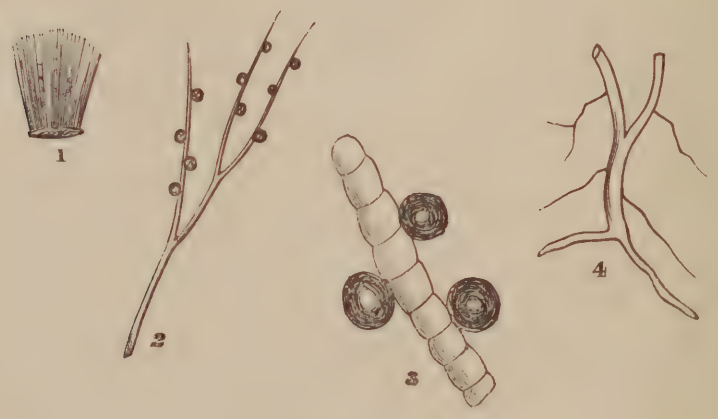
Description.—Root fibrous. Fronds filiform, cylindrical, not tapering upwards, giving out a few filiform, tortuous radicles towards the base, much tufted, from a quarter of an inch to an inch in height, very sparingly branched; branches subdichotomous or alternate, long, slender, and simple, suberect, cylindrical, the apices rounded and obtuse. Occasionally the branches are secund, and more rarely somewhat crowded upwards, articulated throughout. Articulations scarcely so long as their diameter, very faintly striated, somewhat contracted at the dissepiments. Spores sessile, scattered plentifully over the upper branches, frequently crowded with a very thin pellucid limbus. Substance somewhat flaccid, and partially adhering to paper. Colour, a pale brownish olive.

This curious little plant is said to be densely tufted or rather cæspitose, spreading widely over mud-covered rocks, preferring a shelving to a rocky shore, and has been observed from the Land's End to Orkney in distant stations both on the east and west coasts, and it is quite possible that it may be common, its scarceness depending more on its obscurity than its rarity.

Our specimens from Torbay, by the late Mrs. Griffiths, are tall and well fruited; others from the Frith of Forth are scarcely half the size and barren.

Looking at well-developed specimens of *S. cirrhosa*, one would not suppose at first sight that there was much in common in the two forms, yet Agardh, after a very careful comparison, has united them; and indeed, except the ramification, which seems apparent enough, there is little else to distinguish them. *S. cirrhosa*, however, is often observed with simple stems, and then it is no easy matter to distinguish them; this, however, is no reason why the species should not be distinct.

Again, Sir W. Jackson Hooker seems to consider the *S. olivacea* and *S. radicans* of the British Flora as hardly distinct; Professor Harvey united them, and we think very justly, under *S. radicans*. A more careful observation of the different species or forms in their native habitats, is perhaps requisite before we can come to a definite conclusion.



SPHACELARIA RADICANS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Sphacelaria radicans*, tuft, natural size.
2.—Branch.
3.—Same.
4.—Base of stem. All magnified.

SPHACELARIA RACEMOSA.—*Grev.*

Gen. Char.—Fronds filiform, articulated, dichotomously branched; apices of the branches generally more or less distended, as if the apical cell was enlarged and inflated, containing in its centre a dark granular mass of endochrome. Fructification: "elliptical utricles (or spores) furnished with a limbus, borne on the ramuli." Name from σφάκελος, "a gangrene," in allusion to the withered, diseased-like apices of the branches, very characteristic in some of the species.

Sphacelaria *racemosa*.—"An inch in height, tufted, olivaceous, somewhat rigid, the fronds dichotomous; articulations equal in length and breadth; capsules oval, racemose, pedunculate (*Grev.*)"—*Phyc. Brit.*

Sphacelaria *racemosa*.—*Grev. Scot. Crypt. Fl.* vol. ii. t. 96; *Grev. Fl. Edin.* p. 314; *Kütz. Sp. Alg.* p. 466; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 31; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 325; *Harv. Man.* p. 57; *Harv. Syn.* p. 52; *Atlas*, plate 18, fig. 80.

Hab.—In tide-pools? Very rare. Frith of Forth, opposite to Caroline Park (*Sir John Richardson*); Frith of Clyde, rather plentiful (*Mr. R. Hennedy*).

Geogr. Dist.—Only found as above, and there only once, about the year 1821.

Description.—"Plants tufted, about an inch in height, of an olive green or olive brown colour. Frond filiform, somewhat rigid, three to four times dichotomous, the dichotomies acute. Articulations equal in length and breadth, diaphanous to the base; summits of the branches not sphacelated in my specimens, but somewhat dilated and hyaline, as in many other specimens, previous to the sphacelation making its appearance. Fructification: oval capsules, surrounded by a very narrow pellucid border, pedicellate and arranged in a racemose manner, on a common jointed peduncle. Racemes suberect, arising from various parts of the frond (*Grev. Scot. Crypt.* l. c.)"—*Phyc. Brit.*

In structure, this seems very closely related to the preceding, but the fructification in its arrangement is widely different, and forms the most essential character of the species.

We have received specimens under this name, collected on the west coast of Scotland (Cumbræ), but as the fructification is wanting, we feel some hesitation in giving the station or trusting to the characters, the more especially as the articulations are more variable in their relative length and breadth than we would be led to suppose from the figure in *Phycologia Britannica*, many of them being rather longer than

their diameter, although in other respects the characters would agree pretty well.

We are not aware that the species has been found in fruit since it was first gathered by Dr. Richardson, although it has been frequently looked for in the same spot.

SPHACELARIA RACEMOSA.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Sphacelaria racemosa*, tuft, natural size.
2.—Portion with spores.
3.—Apex of a branch.
4.—Spores. All magnified.

Plate CLXXIV.

ECTOCARPUS SILICULOSUS.—*Lyngb.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *siliculosus*.—Fronds flaccid, filiform, very slender, and much branched; branches dichotomous, alternate, or secund; apices attenuated; "*utricles*" stalked, elongate-ovate, acuminate.

Ectocarpus *siliculosus*.—*Lyngb. Hyd. Dan.* p. 131, t. 43; *Ag. Syst.* p. 161; *Grev. Fl. Edin.* p. 314; *Ag. Sp. Alg.* vol. ii. p. 37; *Wyatt, Alg. Danm.* No. 172; *J. Ag. Alg. Medit.* p. 26; *Endl.* 3rd. Suppl. p. 21; *Kütz. Phyc. Gen.* p. 288; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 325; *Harv.* in *Mack. Fl. Hib.* part 3, p. 181; *Harv. P. B.* plate 162; *Harv. Man.* p. 58; *Harv. Syn.* p. 53; *Atlas*, plate 19, fig. 81; *Harv. N. B. A.* part 1, p. 139; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 22.

Ceramium *siliculosum*.—*Ag. Syn.* p. 65; *Hook. Fl. Scot.* part 2, p. 86.

Ceramium *confervoides*.—*Roth, Cat.* vol. i. p. 151, t. 8, f. 3; and vol. iii. p. 148.

Conferva *siliculosa*.—*Dillw. Syn.* No. 112, t. E.; *Engl. Bot.* t. 2319.

Var. β. *longipes*.—Stalks of the utricles very long.

Hab.—Parasitical on various Algæ, between tide-marks, and in two to six fathoms water. Annual. Spring to autumn. Very common. β. at Jersey (*Miss White* and *Mr. F. P. Girdlestone*).

Geogr. Dist.—Atlantic shores of Europe and North America; Mediterranean Sea.

Description.—Fronds filiform, very slender, nearly cylindrical, very soft and tender, three to ten inches or more in length, much tufted and branched; branches irregularly scattered, more or less dichotomous or alternate, nearly cylindrical, but more and more slender upwards; ultimate ramuli excessively delicate, and occasionally secund and acuminate, all erecto-patent. Articulations very slightly constricted at the dissepiments, variable in length, mostly nearly twice as long as their diameter. *Utricles* ovate, acuminate, shortly pedicellate, or in var. β. Harv., "on long stalks," marked by close transverse striæ, "tapering to a fine point, and occasionally produced at the apex into a hyaline filament." They are generally scattered abundantly over the upper

branches. Substance rather soft and flaccid, adhering closely to paper. Colour, a pale greenish brown when young, yellowish brown when old.

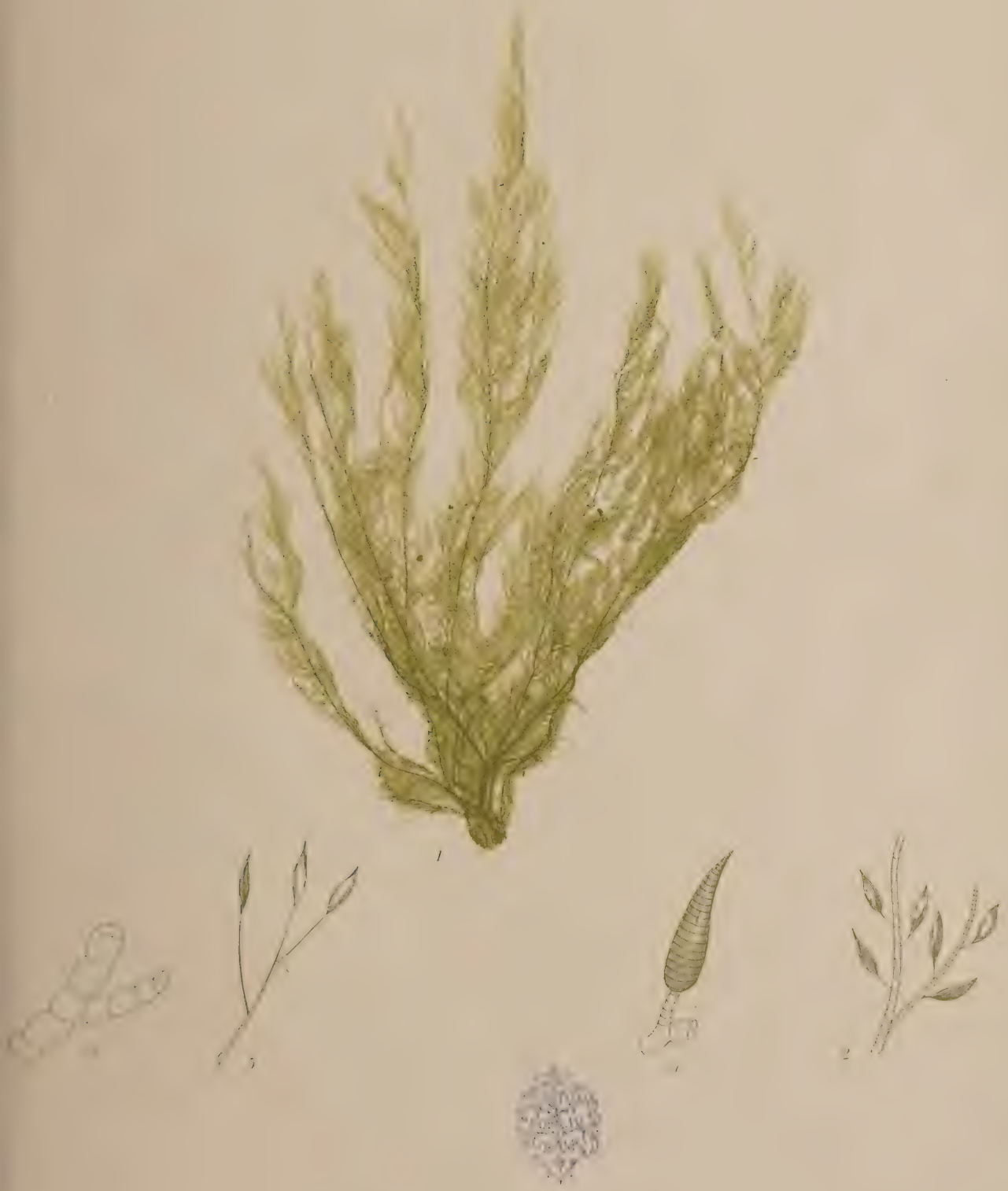
This is one of our most common species, forming large, soft, almost lubricous tufts on *Fuci*, or on almost anything that happens to be within reach, and is generally distributed on almost all our shores in equal abundance, and generally abundantly fruited.

When young, and when floating in the water, the tufts of this species are extremely beautiful, and very tempting to the collector, of a very delicate yellowish brown, with a faint shade of green when young, but which gradually disappears as the plants advance in age.

The variety β. is given on the authority of a specimen sent to Dr. Harvey from Jersey, and which he describes as having long stalks to the fruit, but as otherwise identical.

EXPLANATION OF PLATE CLXXIV.

Fig. 1.—*Ectocarpus siliculosus*, natural size.
2.—Branchlet with fruit.
3.—Articulations of the stem.
4.—Fruit.
5.—Var. β. from *Phyc. Brit.* All magnified.



Ectocarpus siliculosus. Lyngb.

ECTOCARPUS AMPHIBIUS.—*Harv.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *amphibius*.—Fronds tufted, very delicate, slender, and flaccid, subdichotomous or alternate; articulations two to three times longer than broad; "utricles (?) linear attenuate, spine-like, mostly sessile, and scattered."—*Phyc. Brit.*

Ectocarpus *amphibius*.—*Harv. P. B.* plate 183; *Harv. Man.* p. 58; *Harv. Syn.* p. 54; *Atlas*, plate 20, fig. 85; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 25.

Hab.—In muddy ditches of brackish water, near the coast. Tide-ditches communicating with the Avon, below Bristol (*Mr. Thwaites*).

Geogr. Dist. —— ?

Description.—Filaments very slender and flaccid, one to three inches long, "growing on the mud or attached to various substances," much branched in an irregularly dichotomous manner; ultimate ramuli alternate or secund, short, subulate and acute, all suberect. Articulations two to three times as long as broad in the main stems, somewhat shorter upwards; cylindrical, scarcely constricted at the dissepiments, variegated (in the dried specimens at least) with patches, and interrupted bands of condensed endochrome. Fructification: "the ramuli are frequently changed into exceedingly long, sessile, opaque, sporaceous bodies, evidently analogous to the utricle of *Ectocarpus siliculosus*, and of a character intermediate between these and the immersed fructification of *E. littoralis*." —*Phyc. Brit.* Substance very flaccid, and adhering to paper. Colour, a pale yellowish olive.

This species we have only seen in the dry state; it is said to grow in ditches of brackish water, and in such places may be not unfrequent, or it is quite possible, as remarked in *Phyc. Brit.*, that it may be merely "a variety of *E. siliculosus*, altered by its growing in water containing a very small quantity of salt." Even in this view it is interesting, and its history deserves investigation, with a view to ascertain the effect which such an influence would have upon the development of the species.

Such might also throw additional light on the changes that take place in other species under similar influences; changes which in plants that live under water are more than usually abundant, and with which we are as yet but imperfectly familiar. Facts tending to elucidate these changes are the more valuable from the difficulty in collecting them, as it is no easy matter to have the species so permanently under our eye as to enable us to study its economy with sufficient continuity.

ECTOCARPUS AMPHIBIUS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—Tuft of *Ectocarpus amphibius*, natural size.
2.—Branch.
3.—Fruited ramulus. Both magnified.

ECTOCARPUS FENESTRATUS.—*Berk.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *fenestratus.* — "Pale green, very slender, forming small tufts, filaments not much branched; branches distant, alternate, furnished with a few long and simple, alternate ramuli; articulations of the branches twice or thrice as long as broad, pellucid, silicules stalked, scattered, at first clavate, then elliptic-oblong, obtuse, densely striate transversely, and cross-barred, dark brown."—*Phyc. Brit.*

Ectocarpus *fenestratus.—Berk.* in *Herb. Griff. MSS.*; *Harv. P. B.* plate 257; *Harv. Man.* p. 58; *Harv. Syn.* p. 54; *Atlas*, plate 20, fig. 86.

Hab.—Salcombe (*Mrs. Wyatt*). Annual. May. Probably common.

Geogr. Dist.——?

Description.—"Filaments forming small tufts, very slender, one or two inches high, not very much branched; the branches lying apart, and somewhat feathery, alternate, repeatedly divided, all the divisions erect, the ultimate ramuli prolonged and straight. Articulations variable (as in all the genus), usually in the middle part of the stems, twice or thrice as long as broad, full of a pale olive, translucent endochrome, with a very few grains dispersed through it, in the lower part gradually shorter; silicules pedicellate, at first club-shaped and narrow, afterwards becoming elliptic-oblong or somewhat fusiform, but always very blunt at each end. When fully ripened, they are dark coloured, marked with closely set transverse and longitudinal striæ, which mark the surface with small square reticulations, like a mosaic pavement or the lattice of a window; an appearance alluded to in the specific name. Colour pale greenish olive. Substance flaccid, closely adhering to paper."—*Phyc. Brit.*

Of this apparently distinct, very rare, and pretty species we know nothing, and give the characters and description as detailed in *Phyc. Brit.*, where Professor Harvey informs us that its discoverer, Mrs. Wyatt, had only met with it once. It is to be hoped that some other fortunate

collector may rediscover it, and add another proof to its title to rank as a native and a species. It was discovered at Salcombe, but we know nothing further of its habitat.

ECTOCARPUS FENESTRATUS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—Tuft of *Ectocarpus fenestratus*, natural size.
2.—Ramulus in fruit.
3.—Fruit. Both magnified.

Plate CLXXV.

ECTOCARPUS FASCICULATUS.—*Harv.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *fasciculatus*.—Filaments rather stout, gradually attenuated upwards; branches distant, rather short, fascicled, ramuli mostly secund, at length converted into elongate ovate utricles.

Ectocarpus *fasciculatus*.—*Harv. P. B.* plate 273; *Harv. Man.* p. 59; *Harv. Syn.* p. 55; *Atlas*, plate 19, fig. 82; *Harv. N. B. A.* part 1, p. 141; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 22.

Hab.—Between tide-marks, on the larger Algæ; generally on *Laminaria digitata*. Common.

Geogr. Dist.—Atlantic shores of Europe and North America.

Description.—Fronds filiform, cylindrical, rather robust at the base, main filaments scarcely tapering upwards, three to six inches or more in length, repeatedly but not excessively branched; branches patent, rather distant, short and stout, sparingly divided, the ramuli very close, mostly secund, simple, or once or twice divided in a similar manner; the ultimate ramuli frequently arising from each articulation, the lowest the longest, becoming rapidly shorter. Articulations from once and a-half to twice as long as their diameter. Fruit formed from the metamorphosis of the ultimate ramuli, and, like them, closely placed, secund, sessile, ovate-acuminate or elongate-ovate, tapering to an obtuse point, closely striate transversely. Substance rather flaccid, especially in the younger parts, and closely adhering to paper in drying. Colour, at first a fine pleasant olive green, at length pale yellowish brown.

This is a very common, and, when in a good state, a very handsome species, and often, as Professor Harvey observes, forms "a continuous fringe along the segments of the fronds of *Laminaria digitata*, or long brush-like tufts at their apices, occasionally also on the fronds of *L. saccharina* and other Algæ."

The fronds are seldom more than from one and a half to two and a

half or three inches in length, but on the southern shores of the country they are said to grow to a much greater size, and form a much more conspicuous object in almost every tide-pool.

This species, like the rest of the genus, is annual, commencing its vegetation in early spring, and becoming ragged or even mostly disappearing with the first storms of autumn. This tendency to become denuded is, no doubt, greatly promoted by the tufted ramuli rendering them more apt to be broken off, and leaving the denuded stems to form harsh rigid tufts, very unlike the soft, silky fringes of early summer.

EXPLANATION OF PLATE CLXXV.

Fig. 1.—*Ectocarpus fasciculatus*, natural size.
2.—Ramulus.
3.—Fruit. Both magnified.

1

3

2

Ectocarpus fasiculatus, Harv.

Nature Printed by Henry Bradbury.

Plate CLXXVI.

ECTOCARPUS HINCKSIÆ.—*Harv.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *Hincksiæ*. — Filaments densely tufted, repeatedly but rather distantly branched; ramuli curved, closely pectinated on their upper utricles, short, tooth-like, forming a serrated margin along the upper side of the ultimate ramuli.

Ectocarpus *Hincksiæ*.—*Harv. P. B.* plate 22; *Harv. Man.* p. 59; *Harv. Syn.* p. 55; *Atlas*, plate 19, fig. 83; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 22.

Hab.—Parasitical on *Laminaria bulbosa*. Annual. June. Several places on the coasts of England, Scotland, and Ireland. Abundant south of England.

Geogr. Dist.—British Islands?

Description.—Fronds rather stout at the base, and but slightly branched, becoming more so upwards; lower branches and ramuli mostly alternate, upper ones secund and more incurved; on the lower part of the branches the ramuli are few, distant, and very patent, upwards they are closer, more regular, more erect, and secund; each series becoming closer, more incurved, and more regularly pectinated upwards, the ultimate ones filiform, subulate. Fructification: short, conical, tooth-like utricles, forming a serrated edge along the upper side of the ramuli, each joint of the ramulus producing its tooth-like process. Substance rather firm, but closely adhering to paper. Colour, a rather dark greenish olive, becoming paler in age.

This fine species seems to be by no means of unfrequent occurrence on the east coast of Scotland, being frequently thrown on shore with the larger Algæ from deep water after a gale. We have received fine specimens collected at Peterhead, by the Rev. Mr. Yule, and also at Wick by Mr. Peach, much finer than our Irish specimens or any we have met with in Scotland.

In its earlier state, the colour is a fine dark green, with very little

of the olive tint, and the plant might then, and very possibly may be, frequently passed over as a *Cladophora*. As it advances in age, however, the olive tint becomes more apparent, and ultimately they assume a brownish green or olive brown, passing into yellowish brown in decay.

The only species with which there is any risk of confounding it, is the preceding, *E. fasciculatus*, but from that it may be readily known by its more regularly pectinated ramuli, and still more by the short, tooth-like utricles. It seems closely allied to that species, however, both in habit and fructification.

EXPLANATION OF PLATE CLXXVI.

Fig. 1.—*Ectocarpus Hincksiæ*, natural size.
2.—Branch with ramuli.
3.—Ramulus.
4.—Ramulus in fruit. All magnified.

1

3 4 2

Ectocarpus Hincksiae. Harv.

Dublin: Printed by Henry Bradbury.

Plate CLXXVII.

ECTOCARPUS TOMENTOSUS.—*Lyngb.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *tomentosus.*—Filaments excessively fine, very much and irregularly branched, densely compacted and interwoven into a shaggy, rope-like, irregularly divided frond; utricle elliptical, stalked, scattered upon the upper branchlets.

Ectocarpus *tomentosus.—Lyngb. Hyd. Dan.* p. 132, t. 44; *Ag. Syst.* p. 163; *Ag. Sp. Alg.* vol. ii. p. 44; *Grev. Crypt. Fl.* t. 316; *Wyatt, Alg. Danm.* No. 37; *Endl.* 3rd Suppl. p. 21; *Kütz. Phyc. Gen.* p. 290; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 326; *Harv.* in *Mack. Fl. Hib.* part 3, p. 181; *Harv. P. B.* plate 182; *Harv. Man.* p. 59; *Harv. Syn.* p. 56; *Atlas,* plate 19, fig. 84; *Harv. N. B. A.* part 1, p. 141; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 23.

Ceramium *tomentosum.—Ag. Syn.* p. 64; *Hook. Fl. Scot.* part 2, p. 86.

Chantransia *tomentosa.—Endl.* 3rd Suppl. p. 21.

Conferva *tomentosa.—Huds. Fl. Angl.* p. 594; *Lightf. Fl. Scot.* p. 982; *With. Br. Pl.* vol. iv. p. 130; *Dillw. Brit. Conf.* t. 56; *Roth, Cat.* vol. ii. p. 180, and vol. iii. p. 147.

Hab.—Parasitical on *Fucus vesiculosus* and other Algæ, between tide-marks; sometimes on rocks and stones. Common on the British coasts. Annual. Summer.

Geogr. Dist.—Atlantic shores of Europe and America; Cape Horn (*Dr. Hooker*).

Description.—Filaments excessively slender and very much branched, cylindrical, closely compacted, and interwoven into a shaggy, rope-like, much divided frond, two to eight inches or more in length; this compound frond being very dense and compact, almost solid in the centre, and having the outer part formed of free, shaggy filaments; these filaments are extremely slender, much branched in a very irregular manner. Branches flexuous, patent, irregularly scattered, occasionally dichotomous or alternate, the ultimate ones sometimes secund, scarcely tapering, obtuse. Articulations about twice as long as their diameter. Substance very flaccid when young, rather firmer when old, but pretty closely adhering to the paper. Colour, in a young state, a fine pleasant

olive green, browner in age, and at length a deep brown. Utricles elliptical, somewhat oblong and obtuse, shortly pedicellate, scattered upon the upper branches.

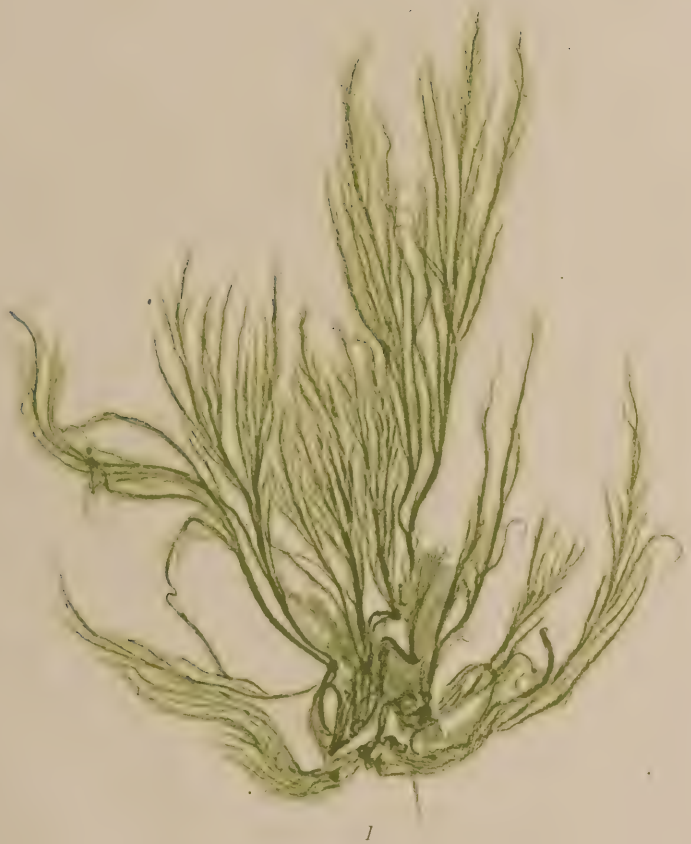
The habit of this species is so peculiar, and so unlike that of any other species of the genus, and indeed of any other British Alga, that it cannot fail to be recognised at a glance. The stems and branches are of considerable thickness, generally from half a line to one or even two lines in diameter, much branched in an irregular manner; these, however, are not the real branches of the plant, but are composed of innumerable excessively fine capillaceo-multifid filaments, twisted, interwoven, and compacted together, so as to resemble a piece of packthread, or rather a piece of felt, only the apices of the filaments being free, give the frond the appearance, when floating freely in the water, of being covered by a dense mass of capillary filaments, so delicate, that when removed from the water they fall down and become closely appressed to the central portion, giving the whole the appearance of a spongy cord.

It is difficult to account for this peculiarity in the habit of this species. Many of the filamentous Algæ have a tendency to be twisted into rope-like bundles, but none of them to anything like such an extent as the present, in which the peculiarity is so remarkable as to become one of structure rather than of habit.

The species is a common one, and seems partial to the fronds of *Fucus vesiculosus*, which are at times, near low-water, almost covered with its shaggy-looking fronds.

EXPLANATION OF PLATE CLXXVII.

Fig. 1.—*Ectocarpus tomentosus*, natural size.
2.—Branch.
3.—Same, more magnified.
4.—Fruit. All magnified.



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Ectocarpus tomentosus. LYNGB.

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Plate CLXXVIII.

ECTOCARPUS CRINITUS.—*Carm.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *crinitus*.—Filaments much tufted or cæspitose, sparingly branched ; branches distant, nearly simple, ramuli very patent ; spores globose, scattered, sessile ; articulations very variable, two to three times their diameter.

Ectocarpus *crinitus*.—*Carm. Alg. App. MSS.* ; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 326 ; *Harv. P. B.* plate 330; *Harv. Man.* p. 60 ; *Harv. Syn.* p. 56 ; *Atlas*, plate 21, fig. 91 ; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 17.

Hab.—On muddy sea shores. Annual. Summer. Rare. Appin (*Capt. Carmichael*) ; Watermouth, Devon (*Mrs. Griffiths*).

Geogr. Dist. —— ?

Description.—Filaments two to four inches long or more, forming extensive cæspitose patches on mud or on mud-covered rocks, excessively slender and delicate, slightly branched ; branches distant, patent, or erecto-patent, very long, mostly simple, or with here and there a short, very patent, cylindrical ramulus, scarcely tapering to the point, which is obtuse. The principal branches are more or less flexuous, and slightly interwoven. Articulations very variable, even in the same filament, from one and a-half to two and a-half times their diameter, scarcely constricted at the dissepiments. Substance rather rigid, membranous, scarcely adhering to paper. Colour, a pale brownish olive. Fructification : minute, spherical, sessile utricles, scattered sparingly on the upper branches.

This species we have only seen in the dried state, and are disposed to think that it may turn out to be not a very uncommon one ; that its unassuming form and obscure haunts, more than its rarity, are the cause of its being so little known. Growing on mud, or on the low mud-covered rocks, its slender and delicate fronds become prostrate when the tide has left them ; and being of the same colour as the mud, may be readily passed over without being observed.

On specimens from Cumbræ, we observe no appearance of fruit, but on others from Millport, minute spore-like bodies are not unfrequent.

E. pusillus, to which this is very closely allied, has generally more equal and rather shorter joints, and is almost always abundantly fruited, the spores mostly opposite, whereas in the present they are always solitary. *E. pusillus* we have always found parasitical on the smaller Algæ in tide-pools, where it is not unfrequent in the summer months. It is also considerably smaller than the present species.

EXPLANATION OF PLATE CLXXVIII.

Fig. 1.—*Ectocarpus crinitus*, natural size.
2.—Branch.
3.—Branch with fruit.
4.—Joints of the stem. All magnified.

Ectocarpus crinitus. Carm.

Nature Printed by Henry Bradbury

ECTOCARPUS PUSILLUS.—*Griff.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *pusillus*.—Filaments very slender, forming small pencil-like tufts, sparingly branched; branches distant, irregular, or alternate; ramuli distant, very patent, utricles roundish, nearly sessile, mostly opposite.

Ectocarpus *pusillus*.—*Griff.* in *Wyatt, Alg. Danm.* No. 212; *E. Bot.* Suppl. t. 2872; *Harv. P. B.* plate 153; *Harv. Man.* p. 60; *Harv. Syn.* p. 56; *Atlas*, plate 21, fig. 92; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 17.

Hab.—Parasitical on several of the smaller Algæ. Annual. Not uncommon. Torquay (*Mrs. Griffiths*); Land's End, St. Michael's Mount, and Ilfracombe (*Mr. Ralfs*); Frith of Forth (*W. G. J.*); Forfarshire (*A. C.*).

Geogr. Dist.—British Islands.

Description.—Filaments very slender, much tufted and interwoven, forming small pencil-like tufts, two to four inches long or more, on other small Algæ, very sparingly branched; branches few, distant, and flexuous, very patent, scarcely tapering, the apices obtuse; ramuli few, often none, very patent, short and simple, slightly tapering to the apex. Articulations about as long as their diameter, slightly inflated in the middle. Substance rather flaccid, adhering rather closely to the paper in drying. Colour, a fine delicate olive green, changing to a brown in age. Fructification: minute, roundish, very shortly pedicellate utricles, generally abundantly scattered over the fronds.

This pretty little species is one of many first recorded by the late Mrs. Griffiths, to whom all lovers of marine botany are greatly indebted for her numerous discoveries both in habits and habitats.

The present species seems to be not unfrequent, preferring quiet, weedy pools between tides, where it grows on the smaller Algæ, on which it is often associated in small pencil-like tufts scattered over the plants. Our Forfarshire specimens are small, scarcely reaching two inches in length, but are abundantly fruited.

In these the colour is a fine delicate, somewhat pale but rather pleasant green, becoming, like that of the other species of the genus, of brownish green or yellowish brown in age.

When fully fruited, it is one of the prettiest specimens under the microscope, although its small size does not render it either conspicuous or highly ornamental in its native tide-pool, where it is almost lost among the more numerous and comparatively giant Chlorosperms, which cast a gleam of verdant light over every pool during the latter days of summer, throwing less obtrusive beauties entirely into the shade.

ECTOCARPUS PUSILLUS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Ectocarpus pusillus*, tuft, natural size.
2.—Branch.
3.—Same. Both magnified.

ECTOCARPUS DISTORTUS.—*Carm.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *distortus.* — Filaments excessively tufted and matted together, much branched in a subdichotomous or alternate manner; branches curved, patent; ramuli patent, short, irregularly scattered; "spores obovate, sessile, or subsessile."—*Phyc. Brit.*

Ectocarpus *distortus.*—*Carm. Alg. Appin. MSS.* cum ic.; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 326; *Harv. P. B.* plate 329; *Harv. Man.* p. 60; *Harv. Syn.* p. 57; *Atlas*, plate 20, fig. 87; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 24.

Hab.—Parasitical on the leaves of *Zostera marina.* Annual. Summer and autumn. Appin (*Capt. Carmichael*, 1824; *Rev. Dr. Landsborough*, 1850).

Geogr. Dist. —— ?

Description.—Filaments much tufted, two to four inches or more in length, very densely and intricately interwoven into a close spongy mass, much branched in a very irregular manner, between dichotomous, alternate, and secund; branches very patent, rather short, curved, bent and contorted in every possible variety of form and angle; ramuli rather few, short, simple, and spine-like, of very unequal length, but all very patent, sometimes a mere knob, at other times a line or more in length, slightly tapering towards the apices, which are rounded and somewhat obtuse. Articulations about as long as broad, cylindrical, scarcely contracted at the dissepiments; nearly filled with dark brown endochrome. Substance rather rigid and brittle, scarcely adhering to paper in drying. Colour, when old at least, a dark umber brown. Fructification we have not seen; it is described in *Phyc. Brit.* as "obovate, sessile, or subsessile."

This curious species was sent to us in the autumn of the present year (1859), from the Moray Frith, where it was picked up by Mr. Hugh Ross, pupil teacher, a young and enthusiastic observer of Campbelton. It was growing on the "Skales purse," which it entirely covered on that side which had been uppermost. Since then, in examining a quantity of sea-

weeds collected in that neighbourhood during the past summer, we were pleased to find numerous specimens of various Algæ, such as *Polysiphonia nigrescens*, *fibrata*, and *elongata*, quite shaggy with the present species, growing in large matted tufts, of a fine orange brown colour.

We have not the least doubt but that the plant is abundant in the inner basins at least of the Moray Frith. It is singular, however, that no appearance of fructification was observed on any of the specimens, which would appear to be very rare. We hope, however, that some of our numerous friends in that quarter may yet succeed in finding it.

The uncertain appearance of the fruit of some plants, as well as of the plants themselves, is a curious circumstance, and one not yet satisfactorily explained. It is one, however, of great interest, and which we should like to see more carefully investigated.

We have often had occasion to notice it, both among flowering plants and Cryptogams, and in both many curious instances of it have come under our observation.

ECTOCARPUS DISTORTUS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Ectocarpus distortus*, natural size.
2.—Branch.
3.—Portion of same. Both magnified.

ECTOCARPUS LANDSBURGII.—*Harv.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *Landsburgii.*—"Filaments dark brown, tenacious, intricate, much branched; branches irregularly forked, divaricated, zigzag, bristling with numerous short, spine-like, horizontal ramuli; articulations shorter than broad, the endochrome filling the cell, and recovering its shape on being moistened after having been dried."—*Phyc. Brit.*

Ectocarpus *Landsburgii.*—*Harv. P. B.* plate 233; *Harv. Man.* p. 60; *Harv. Syn.* p. 57; *Atlas*, plate 20, fig. 88; *Harv. N. B. A.* part 1, p. 143.

Hab.—Dredged in deep water, in land-locked bays. Rare. Annual. Summer. Lamlash, Isle of Arran (*Rev. D. Landsborough*); Roundstone Bay, Galway (*Dr. Harvey*).

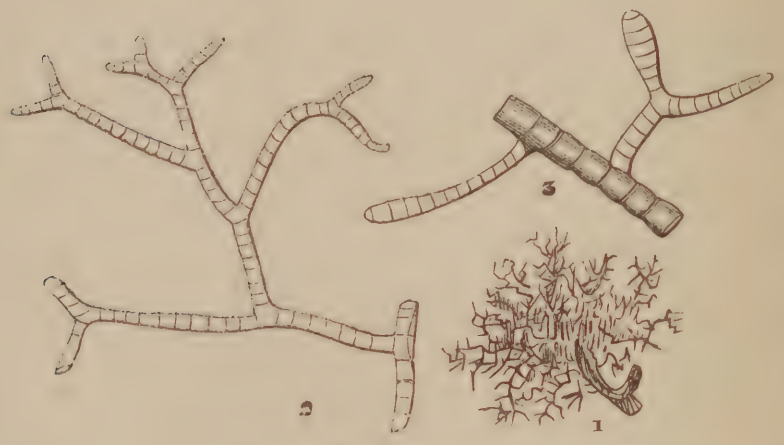
Geogr. Dist.—Shores of Scotland and Ireland; Halifax Bay; Nova Scotia.

Description.—"Filaments capillary, one or two inches in length, densely entangled in small tufts or rolled together in masses, irregularly much branched, of about the same diameter from the base to the apex; branches spreading at wide angles, dichotomous or alternate, the lesser divisions very patent, horizontal or recurved; ramuli short, spine-like, horizontal, simple or forked, not half a line in length, now thinly, now thickly scattered over the branches, rarely opposite. Articulations shorter than broad, filled by a coloured bag; the dissepiments and border very narrow. Substance tenacious and membranous, not closely adhering to paper, and not affected by long steeping in fresh water. Colour, a dark brown."—*Phyc. Brit.*

We are unable to form any opinion as to the claims of this form to specific distinction. We have received specimens from Dr. Dickie and others, which appear to be correctly named, yet we have not the least hesitation in saying, that had we examined these without names, we would at once have set them down as *E. distortus*, and have considered the difference in the contained thread of endochrome as only the effect of age or of drying. Our specimens of *E. distortus*, also from the Moray Frith, referred to under that species, we would have referred without

hesitation to the figure of the present in *Phyc. Brit.* with which they perfectly agree in habit and branching, had not the contracted nodes of endochrome, on which Professor Harvey makes the distinction depend, obliged us to refer it to that species, with which it also accords in size and habitat.

We therefore give the species rather in deference to the high authority who introduced it than from any conviction of its being distinct; acknowledging at the same time that we have not had an opportunity of examining authentic specimens.



ECTOCARPUS LANDSBURGII.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Ectocarpus Landsburgii*, natural size.
2.—Branch.
3.—Portion of same. Both magnified.

Plate CLXXIX.

ECTOCARPUS LITORALIS.—*Lyngb.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *litoralis.* — Fronds very much tufted, main filaments rather stout, much and irregularly branched; branches erecto-patent, mostly scattered, occasionally opposite or alternate; fructification imbedded in the upper branchlets, in the form of oblong, somewhat swollen masses.

Ectocarpus *litoralis.*—*Lyngb. Hyd. Dan.* p. 130, t. 42 (excl. var. β.); *Ag. Sp. Alg.* vol. ii. p. 40; *Wyatt, Alg. Danm.* No. 129; *Kütz. Phyc. Gen.* p. 289; *Endl.* 3rd Suppl. p. 21; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 325; *Harv.* in *Mack. Fl. Hib.* part 3, p. 181; *Harv. P. B.* plate 197; *Harv. Man.* p. 61; *Harv. Syn.* p. 58; *Atlas,* plate 21, fig. 93; *Harv. N. B. A.* part 1, p. 139; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 18.

Ectocarpus *compactus.*—*Ag. Sp. Alg.* vol. ii. p. 41.

Ectocarpus *ferrugineus.*—*Ag. Syst.* p. 163; *Ag. Sp. Alg.* vol. ii. p. 43; *Kütz. Phyc. Gen.* p. 289.

Conferva *litoralis.*—*Linn. Sp. Pl.* p. 1634; *Huds. Fl. Angl.* p. 594; *Lightf. Fl. Scot.* p. 979; *With. Br. Pl.* vol. iv. p. 130; *Roth, Cat. Bot.* vol. i. p. 152; *Dillw. Conf.* t. 31; *E. Bot.* t. 2290.

Hab.—Parasitical on *Fuci* and *Laminariæ,* within and beyond tide-mark. Perennial? At all seasons. Common.

Geogr. Dist.—Abundant throughout the Northern and Atlantic Oceans.

Description.—Fronds forming often large brush-like tufts, three to eight inches or more in length. Main stem rather stout, branched from near the base in a capillaceo-multifid manner; branches mostly irregular, rarely dichotomous, occasionally opposite or alternate, gradually tapering upwards to a somewhat obtuse apex, erecto-patent, free when young, but when old becoming much entangled and interwoven into more or less compact, rope-like masses: the lower branches are generally the longest, becoming gradually shorter upwards, but very irregularly. Articulations about as long as, or a little longer than their diameter, cylindrical, scarcely contracted at the dissepiments. Substance soft and flaccid, and closely

adhering to the paper in drying. Colour, when young, a greenish olive, rusty brown when old. Fructification: consisting of oblong swellings scattered among the upper ramuli, one or two near the middle or towards the base of each ramulus, and containing a dark coloured mass.

This is perhaps the most common, as well as the most abundant species of the genus, forming large and beautifully silky masses, mostly but not exclusively parasitical, in rock-pools, on the shelving shore, either between tides or in deeper water. It is most frequent, perhaps, on *Fucus vesiculosus* and *serratus*, but may be observed on all the larger, and even occasionally on the smaller species of Algæ, its fine brownish olive, or, when past maturity, deep rusty brown, silky flagellæ, forming a conspicuous object among every mass of sea-weed, either strewn on the beach or in their native waters.

It is one of the largest, and, although common, is one of the handsomest of the genus, at least when growing in its native pools; its fine silky fronds being so excessively divided, that the mass retains the water like a sponge, or rather like a quantity of wool.

Although very irregular in its ramification, it is very constant to that irregularity, and the fructification, which is very rarely entirely wanting, will at once serve to distinguish it from the other species of the genus, with none of which is it likely to be confounded excepting the following, and from that it can scarcely be distinguished excepting by its fruit.

EXPLANATION OF PLATE CLXXIX.

Fig. 1.—*Ectocarpus litoralis*, natural size.
2.—Branch.
3.—Fruit. Both magnified.

Ectocarpus litoralis, Lyngb.

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ECTOCARPUS LONGIFRUCTUS.—*Harv.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *longifructus.*—Fronds much tufted and branched; branches irregular; ramuli mostly opposite; the ultimate ones short, spine-like. Fructification terminal, linear-ovate, acuminate, transversely striate.

Ectocarpus *longifructus.*—*Harv. P. B.* plate 258; *Harv. Man.* p. 61; *Harv. Syn.* p. 58; *Atlas,* plate 21, fig. 94; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 25.

Hab.—Parasitical on Algæ, between tide-marks. Common.

Geogr. Dist.——?

Description.—Fronds forming large tufts, four to eight inches or more in length, excessively branched; branches irregular, mostly opposite, especially the upper ones, but occasionally alternate; the ultimate divisions mostly pinnated with short, spine-like ramelli, opposite or alternate; all the divisions erecto-patent, slightly tapering upwards. Most of the branches, the ramuli, and not unfrequently the upper ramelli, are tipped with the long pod-like fructification, which is ovate at the base, and gradually tapering to a long acuminate point, marked with close transverse striæ, and filled apparently with dark granular endochrome. Articulations about as long as, or a little longer than their diameter. Substance rather flaccid, and closely adhering to paper in drying. Colour, when young, a fine olive green, which changes to a rusty brown in age.

As we have already observed, under the last species, this beautiful plant is so closely related to it in habit, that it is with no small difficulty they can be distinguished, if they can be so without having recourse to the fructification. The branching is perhaps in the present somewhat more regularly opposite, and the ultimate divisions more spine-like, of more uniform length; but we fear these characters are unsatisfactory, as they cannot always be depended on.

In the fructification, however, there is a decided and readily appreciable difference. In the last species, the pod-like fruit is generally

about or even below the middle of the branchlet in which it occurs; whereas in the present, it extends to its apex, and is greatly prolonged beyond the point at which it would naturally terminate. This is a sufficiently obvious character, and one which, seeming constant, will readily serve to distinguish the species; but whether it will serve to constitute them separate species is a different question, and one which future observation may be able to determine.

The colour of the two plants, so far as our observation goes, is the same; a fine soft olive green when young, changing to a more or less dark rusty brown when they have reached maturity.

The present is almost as common as the last, forming a very conspicuous object in every tide-pool.

ECTOCARPUS LONGIFRUCTUS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—Branch.
2.—Fruit. Both magnified.

Plate CLXXX.

ECTOCARPUS GRANULOSUS.—*Ag.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *granulosus*.—Fronds densely tufted, very slender, much branched; branches more or less regularly bipinnate or tripinnate; pinnæ mostly, and pinnulæ almost always opposite; utricles broadly elliptical, sessile.

Ectocarpus *granulosus*.—*Ag. Syst.* p. 163; *Ag. Sp. Alg.* vol. ii. p. 45; *Harv. P. B.* plate 200; *Harv.* in *Hook. Brit. Fl.* vol. ii. p. 326; *Harv.* in *Mack. Fl. Hib.* part 3, p. 182; *Harv. Man.* p. 61; *Harv. Syn.* p. 59; *Atlas*, plate 22, fig. 95; *Endl.* 3rd Suppl. p. 21; *Wyatt, Alg. Danm.* No. 38; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 21.

Conferva *granulosa*.—*E. Bot.* t. 2351.

Hab.—On rocks, corallines, and various Algæ, in rock-pools, between tide-marks. Annual. May and June. Not uncommon.

Geogr. Dist.—Heligoland; coast of France.

Description.—Fronds densely tufted, slightly entangled, capillaceous, three to eight inches long or more, much branched; branches erecto-patent, tapering to a more or less acute point, regularly pinnated, bipinnated, or even, in luxuriant specimens, tripinnate; pinnæ, and especially pinnulæ, opposite; the hairs of the ultimate pinnules frequently defective, slender and subulate, all erecto-patent, gradually attenuated to a fine point, and becoming shorter and less compound upwards. Articulations about as long as broad, slightly contracted at the dissepiments. Substance soft and flaccid, and adhering closely to the paper. Colour, a fine, rather pale, transparent olive green when young, becoming of a yellowish brown when old. Fructification: roundish, elliptical utricles, scattered pretty plentifully among the upper ramuli, sessile, on the upper edge, and generally near the base of the ramuli.

This fine species appears to be not unfrequent on various parts of the coast, becoming still more plentiful as we proceed southward; and

on the southern shores of England and the Channel Islands it seems to be common. We have received finely fruited specimens from Mr. Albert Hamburgh, Isle of Wight; and from the Rev. J. Yuil, of Peterhead.

The fruit seems to be generally produced in greater or less plenty, as we have not seen any specimens without it, and is very characteristic of the species, without which it may generally be known by its more regularly opposite, not quaternate branching; the upper pinnules fewer, and often defective.

Professor Harvey, however, considers it not unlikely that more than one species may be included under the present, as he has observed considerable diversity in the ramification. We have not seen any of these aberrant forms, but believe the same observation might be very justly applied to several other species of the genus; not, however, for the purpose of creating species, but of evolving the causes which influence their variations.

EXPLANATION OF PLATE CLXXX.

Fig. 1.—*Ectocarpus granulosus*, natural size.
2.—Branch.
3.—Fruit. Both magnified.

1

Ectocarpus granulosus. Ag.

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Plate CLXXXI.

ECTOCARPUS SPHÆROPHORUS.—*Carm.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in the substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *sphærophorus*.—Fronds densely tufted, very slender, and much branched; lower branches mostly quaternate, upper opposite; "spores globose, sessile, either opposite to each other or to a branchlet."

Ectocarpus *sphærophorus*.—*Carm. Alg. Appin.* ined.; *Wyatt, Alg. Danm.* No. 173; *Harv.* in *Hook. Br. Fl.* vol. ii. p. 326; *Harv.* in *Mack. Fl. Hib.* part 3, p. 182; *Harv. P. B.* plate 126; *Harv. Man.* p. 61; *Harv. Syn.* p. 59; *Atlas*, plate 20, fig. 89; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 17.

Ectocarpus *brachiatus*.—*Ag. Sp. Alg.* vol. ii. p. 42.

Hab.—Parasitical on the smaller Algæ, between tide-marks. Annual. Summer. Not common, but found at intervals from Land's End to Orkney.

Geogr. Dist.—British Islands.

Description.—Fronds densely tufted, but not much entangled, very slender, very much branched; branches subpatent, or erecto-patent, at first opposite, at length mostly quaternate below or about the middle, opposite upwards, with rather long slender pinnules, which are subulate, tapering to a more or less acute point; the lower pinnules longest, becoming uniformly shorter upwards. Articulations about as long as their diameter, somewhat inflated in the middle, and contracted at the dissepiments. Substance soft, and very closely adhering to the paper in drying. Colour, when young, a fine greenish olive, gradually changing to a yellowish brown. Fructification: sessile, spherical capsules, produced by the metamorphosis of the ultimate ramuli, opposite when both are so changed, and opposite a ramulus when only one is so. Small, with a rather thick pellucid limbus.

This pretty little species is apparently not unfrequent on many parts of the coast; but it appears to be not very abundant anywhere.

On the east coast, it is not unfrequent growing parasitical on the smaller Algæ, such as *Rhodomela subfusca*, *Polysiphonia nigrescens*, &c.,

in the smaller, quiet tide-pools, where its small delicate fronds, or rather tufts, may often pass unobserved among its more conspicuous neighbours.

The fructification is by no means infrequent, and readily serves to distinguish this species from its nearest allies, *E. granulosus* and *E. brachiatus*, both of which, and especially the latter, are closely allied to it, so much so, that some able botanists consider the difference in fructification, noticed in *Phyc. Brit.*, as rather indicative of a different condition of the same species than characteristic of a different species, as is now understood to be the case among the *Rhodosperms*. Should this prove to be the case (which is by no means unlikely), our present ideas of species will require to be greatly modified.

Our Scottish specimens of this are very small, scarcely reaching an inch in length, but are otherwise very characteristic.

EXPLANATION OF PLATE CLXXXI.

Fig. 1.—*Ectocarpus sphærophorus*, natural size.
2.—Branch.
3.—Fruit. Both magnified.

Ectocarpus sphaerophorus. Carm.

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ECTOCARPUS BRACHIATUS.—*Harv.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *brachiatus.*—Fronds very delicate, densely tufted and branched; branches opposite, middle ones at length quaternate, subpatent or erecto-patent; spores "imbedded in the branches, forming oblong swellings, situated on the lesser branches, or in the axils of two opposite ramuli."

Ectocarpus *brachiatus.*—*Harv.* in *Hook. Br. Fl.* vol. ii. p. 326; *Harv. P. B.* plate 4; *Harv. Man.* p. 62; *Harv. Syn.* p. 60; *Atlas*, plate 20, fig. 90; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 20; *Wyatt, Alg. Danm.* No. 174.

Ectocarpus *cruciatus.*—*Ag. Sp. Alg.* vol. iii. p. 44; *Endl.* 3rd Suppl. p. 21.

Conferva *brachiata.*—*E. Bot.* t. 2571.

Hab.—Rare. At Cley, Norfolk, in brackish water, 1808 (*Sir W. J. Hooker*); in the sea on *Rhodymenia palmata*, at Torquay (*Mrs. Griffiths*); Youghal, July 1837 (*Miss Ball*); Lambay, 1838 (*Mr. W. Thompson*); Ardrossan, Ayrshire (*Rev. Dr. Landsborough*).

Geogr. Dist.—Only known as above.

Description.—Fronds forming small pencilled tufts, one to three inches high or more, much tufted, very slender and branched; branches capillaceous, tapering, pinnated or bipinnated, with numerous rather slender pinnules, opposite or quaternate, subpatent, very flexile. The branching at the base becomes somewhat irregular, by repeated innovations; the intermediate pinnæ are mostly quaternate, whilst towards the summit they are simply pinnate, slightly tapering, and with the apices rather obtuse. Substance rather flaccid, and more or less adherent to the paper in drying. Colour, at first greenish olive, rather pale, and changing as it advances in age to a pale, somewhat brownish orange yellow. Fructification: roundish angular spores, immersed at the articulations of the ramuli, or occasionally in the ramuli themselves.

In our specimens, there is certainly a very marked difference between the colour of the present and that of the preceding; but that we consider of little importance, as the colour in the present genus is

assuredly of very little importance as a specific character; all the species, we believe, being more or less of a greenish olive when young, and changing to a brownish or orange yellow when old.

With respect to the present species, the fructification is certainly the most obvious character. The articulations in both are much about the same, or in the present perhaps a little longer, being about as long as their diameter in the main branches, and a little longer than their diameter in the pinnules.

We have been kindly favoured with specimens of the present species in fruit from the Isle of Wight, collected by our kind correspondent, Mr. Albert Hamburgh, as well as by other friends from the west of England; they are all marine, and are attached to old fronds of *Rhodymenia palmata*. The fructification is mostly confined to the joints, but occasionally a spore is observed immersed in the internode.

ECTOCARPUS BRACHIATUS.

EXPLANATION OF DISSECTIONS.

Fig. 1.—Branch.
2.—Same.
3.—Fruit. All magnified.

Plate CLXXXII.

ECTOCARPUS MERTENSII.—*Ag.*

Gen. Char.—"Frond capillary, jointed, olive or brown, flaccid, single-tubed. Fruit, either spherical, elliptical, or lanceolate utricles (or spores), borne (externally) on the ramuli, or imbedded in their substance." Name from ἐκτὸς, "external," and καρπὸς, "fruit." A name equally applicable to many other genera, and unfortunately only to a few of the species in the present.

Ectocarpus *Mertensii.*—Fronds much tufted, long, slender, and cylindrical, very distantly pinnated or occasionally bipinnated; pinnæ opposite, everywhere beset with close, distichous ramuli, in the middle of which are immersed elliptical binate spores.

Ectocarpus *Mertensii.—Ag. Sp. Alg.* vol. ii. p. 47; *Hook. Br. Fl.* vol. ii. p. 327; *Wyatt, Alg. Danm.* No. 130; *Endl.* 3rd Suppl. p. 21; *Harv. P. B.* plate 132; *Harv. Man.* p. 62; *Harv. Syn.* p. 60; *Atlas,* plate 22, fig. 96; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 20.

Conferva *Mertensii.—E. Bot.* t. 999; *Dillw. Conf.* Suppl. p. 79.

Hab.—On mud-covered rocks and stones from low-water mark to four fathoms. Annual. April to June. Not common; but generally distributed round all our coasts.

Geogr. Dist.—British Islands; Atlantic shores of France.

Description.— Fronds densely tufted, occasionally slightly entangled, long, slender, and but sparingly branched, pinnate or bipinnate; pinnæ and pinnules opposite, very unequal, a short and a long one often opposite, forming tufts from four to six inches or more in length; the stems and pinnæ everywhere beset with distichous, spine-like, opposite, very unequal ramuli, a pair generally arising from the summit of each articulation; they are short, scarcely tapering, except at the apices, which when young are piliferous, their middle swelling into an elliptical tubercle, which contains immersed two roundish angular granules, or one transversely biparted. Substance rather flaccid, and closely adhering to paper. Colour, when young, a fine rather dark olive green, changing to a greenish brown, or at length to a yellowish brown when old. Articulations in stem nearly as long as their diameter, becoming shorter upwards, until in the pectinated ramuli they are several times shorter than their diameter.

"This charming plant, one of the rarest and most beautiful of the

filiform marine Algæ, is one of the many interesting discoveries which we owe to Mr. Lilly Wigg, of Yarmouth, who first gathered it in the year 1799. It was named by Mr. Turner, in compliment to the late celebrated Professor Mertens, of Bremen."—*Phyc. Brit.*

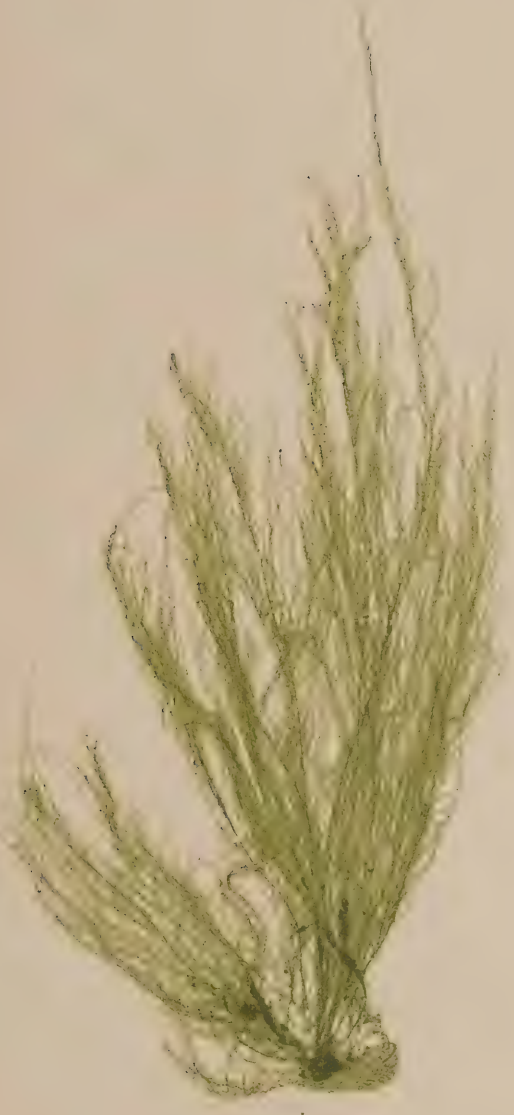
This fine species, at one time so much sought after on account of its rarity, is still as much admired for its beauty; and although now found in very many places on the British shores, is by no means abundant. We have received beautifully fruited specimens from the Rev. James Yuil, of Peterhead, and others equally beautiful, though barren, from the coast of Ayrshire.

In our Peterhead specimens, the ramuli often contain several spores, placed the one above the other in a string, thus occupying almost the whole of the ramulus, and in these the spores are occasionally single, although they are mostly binate.

No other British species of the genus can be at all confounded with the present; its beautifully doubly pectinated ramuli are strikingly characteristic, and indeed more closely assimilate the plant to some of the *Sphacelariæ* than to any of the other species of the present genus.

EXPLANATION OF PLATE CLXXXII.

Fig. 1.—*Ectocarpus Mertensii*, natural size.
2.—Branch.
3.—Portion of same with fruit.
4.—Same. All magnified.



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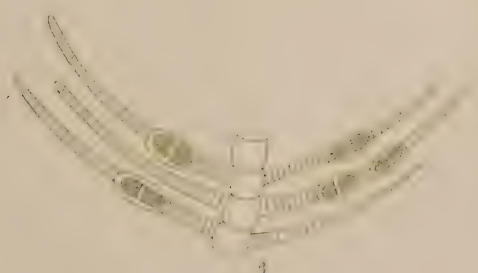

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Ectocarpus Mertensii. Ag.

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MYRIOTRICHIA CLAVÆFORMIS.—*Harv.*

Gen. Char.—"Filaments capillary, flaccid, jointed (simple), beset with quadrifarious, simple, spine-like ramuli, clothed with byssoid fibres. Fructification: elliptic utricles (or spores?), containing a dark-coloured sporaceous mass." Name from μυρίος, "a thousand," and θρίξ, "a hair."—*Phyc. Brit.*

Myriotrichia *clavæformis.*—Fronds consisting of a single stem, everywhere beset from near the base with quadrifarious ramuli, increasing in length upwards to near the summit, giving the frond a club-shaped outline.

Myriotrichia *clavæformis.*—*Harv.* in *Hook. Journ. Bot.* vol. i. p. 300, t. 138; *Harv.* in *Mack. Fl. Hib.* part 3, p. 182; *Harv. P. B.* plate 101; *Harv. Man.* p. 63; *Harv. Syn.* p. 61; *Atlas*, plate 22, fig. 101; *Wyatt, Alg. Danm.* No. 131; *Endl.* 3rd Suppl. p. 24; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 13.

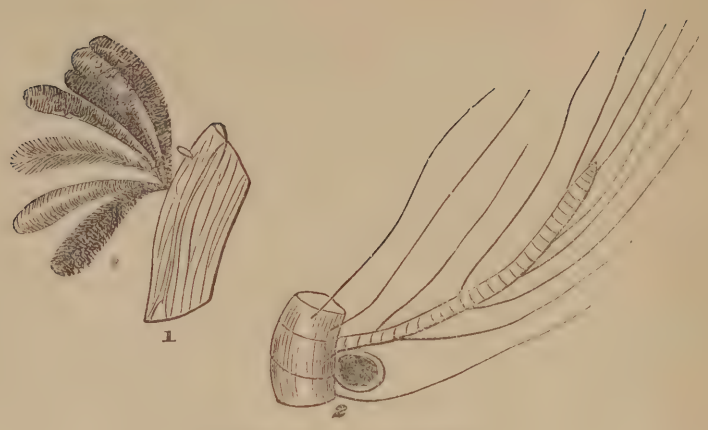
Hab.—Parasitical on *Chorda lomentaria.* Annual. Summer. Not uncommon round the British Islands.

Geogr. Dist.—British Islands.

Description. — Fronds tufted, minute, parasitical, simple. Stems subcylindrical or slightly club-shaped, everywhere beset from a little above the base with subclavate filaments, very patent and quadrifarious, the lower ones very short, gradually increasing in length upwards to the summit, only a few of the apical ones being shorter, giving the fronds a clavate outline. The lower part of the stem and the ramuli are covered with fine byssoid filaments with cylindrical joints, three to four times longer than their diameter, those of the ramuli being about as long as their diameter. Substance very flaccid, closely adhering to paper. Colour, a pale greenish olive. Fructification: elliptical "utricles" (or spores) attached to the main threads at the base of the ramuli.

This curious and minute parasite is likely to prove not uncommon, its minuteness, no doubt, having caused it to be frequently overlooked. It is often more conspicuous from its numbers than from its individual size, giving a shaggy and coarse appearance to the fronds that are affected with it to any extent.

We have only seen specimens from the south-west of England, although we believe it may be occasionally met with on all our shores; but, like other parasites of a similar nature, its appearance is very uncertain.



MYRIOTRICHIA CLAVÆFORMIS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Myriotrichia clavæformis*, tuft, natural size.
2.—Ramulus with fruit, greatly magnified.

MYRIOTRICHIA FILIFORMIS.—*Harv.*

Gen. Char.—"Filaments capillary, flaccid, jointed (simple), beset with quadrifarious, simple, spine-like ramuli, clothed with byssoid fibres. Fructification: elliptic utricles (or spores?), containing a dark-coloured sporaceous mass." Name from *μυρίος*, "a thousand," and *θρίξ*, "a hair."—*Phyc. Brit.*

Myriotrichia *filiformis*.—"Stem filiform, slender, often flexuous or curled, beset at irregular intervals with oblong clusters of short, papiliform ramuli."—*Phyc. Brit.*

Myriotrichia *filiformis*.—*Harv. P. B.* plate 156; *Harv. Man.* p. 63; *Harv. Syn.* p. 61; *Atlas*, plate 22, fig. 98; *Wyatt, Alg. Danm.* No. 213; *J. G. Agardh, Sp. Gen. Alg.* vol. i. p. 14.

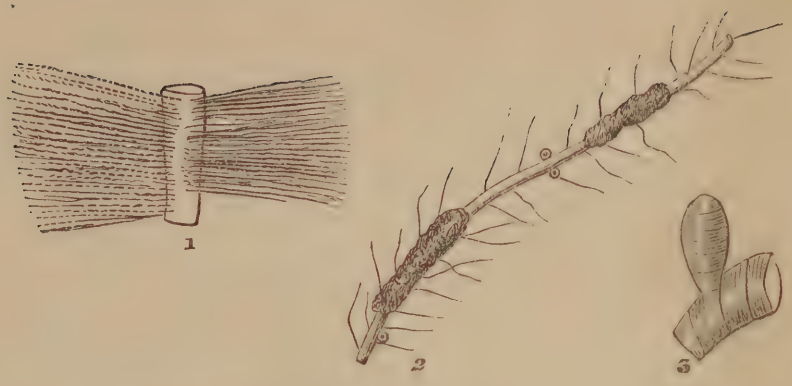
Hab.—Parasitical on *Chorda lomentaria*. Annual. Summer. Not uncommon.

Geogr. Dist.—British Islands.

Description.—Fronds tufted, simple, filiform, the tufts often confluent, half an inch to an inch or more in length, very slender, capillaceous, cylindrical, articulated; the articulations shorter than their diameter, having here and there short cylindrical portions, somewhat thicker than the stem itself, the thickened portion consisting of numerous short, close-set, papiliform, articulated ramuli, which, as well as the stem itself, are covered with long, slender, hyaline, articulated filaments, with oblong joints, three to five times longer than their diameters. Fructification: spherical, sessile spores, scattered sparingly over the main filament. Substance flaccid, closely adhering to paper. Colour, a pale olive green, changing to a yellowish brown.

The present is understood to be the more common species of this curious genus, but from its minute and inconspicuous ramuli, and the consequent slender and uniformly filiform appearance of the stems, it is still more likely to be overlooked or mistaken for some incipient form of other Algæ, or even for the byssoid filaments so frequent on all Algæ.

It is, perhaps, also much less restricted to the fronds of *Chorda lomentaria* than what was supposed, as our specimens are attached to a frond of *Laminaria*. They are from Donegal.



MYRIOTRICHIA FILIFORMIS.

EXPLANATION OF DISSECTIONS, &c.

Fig. 1.—*Myriotrichia filiformis*, tufts, natural size.
2.—Frond.
3.—Fruit. Both magnified.

END OF VOL. III.

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